NUCLEAR SCIENCE ABSTRACTS

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BIOLOGY AND MEDICINE

RADIATION HAZARDS AND PROTECTION

12313 M-3328
[Clinton Labs., Oak Ridge, Tenn.]
URANIUM TOLERANCE. K. Z. Morgan. Jan. 14, 1946. Decl. Mar. 6, 1957. 13p. $3.30(ph OTS); $2.40(mf OTS).

Biological tolerances for uranium and uranium compounds are summarized briefly. (M.H.R.)

12314 ORNL-2102
Oak Ridge National Lab., Tenn.
ANALYSIS OF THOREX PILOT PLANT RADIATION EXPOSURES DURING 1955. W. T. McCarley. Nov. 16, 1956. Decl. Mar. 2, 1957. 69p. Contract W-7405-eng-26. $0.55(OTS).

An analysis of radiation exposure received by Thorex pilot plant personnel during 1955 is given. The analysis reveals where and why the radiation was received and what shielding, modification, or technique could be used to reduce the 60 mrep man-week average. The information should be useful in new plant design. (T.R.H.)

12315 UCLA-111
California. Univ., Los Angeles. Atomic Energy Project.
SUMMARY OF THE RADIOLOGICAL FINDINGS IN ANIMALS FROM THE BIOLOGICAL SURVEYS OF 1947, 1948, 1949, AND 1950. James L. Leitch. Feb. 7, 1951. Decl. Mar. 5, 1957. 30p. Contract AT-04-1-GEN-12. $4.80(ph OTS); $2.70(mf OTS).

The results of the radiological assay of more than 3000 tissues and organs from random sampling of animals collected during the Biological Field Surveys of 1947, 1948, 1949, and 1950, inclusive, from the areas contaminated by the fall-out from the first atomic bomb detonation in New Mexico are summarized. Deposition of α and $\beta-\gamma$ emitters, primarily in liver and bone, was first detected in the fourth year and definitely established in the fifth year after the detonation, suggesting an accumulative process. Some evidence for spreading of the area of contamination has been found. The complexity of the interacting factors affecting such surveys is indicated. (G.Y.)

CHEMISTRY

12316 BMI-1073
Battelle Memorial Inst., Columbus, Ohio.
DEGRADATION PRODUCTS OF TRIBUTYL PHOSPHATE. Robert A. Ewing, Samuel J. Kiehl, Jr., and Arthur E. Bearse. Feb. 17, 1956. Decl. Apr. 2, 1957. 54p. Contract W-7405-eng-92. $0.45(OTS).

A method for determination of dibutyl phosphate (DBP) in solvent streams containing tributyl phosphate (TBP) is outlined. The method is based on analysis for total U or total PO_4^{3-} after removal of U and PO_4^{3-} in excess of that present as uranyl dibutyl phosphate. Results on plant solvent samples are presented. Difficulties with precipitation of uranous dibutyl phosphate, when fresh solvents were employed, are discussed. Small amounts of nonphosphate uranium-complexing agents were found in plant solvents. Diluent degradation is postulated as the source of these components. Emulsion-formation tendencies appeared to correlate better with concentrations of these contaminants than with DBP content. (auth)

12317 BMI-1088(Del.)
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING APRIL 1956. Russell W. Dayton and Clyde R. Tipton, Jr. May 1, 1956. Decl. with deletions Feb. 13, 1957. 82p. Contract W-7405-eng-92. $12.30(ph OTS); $4.50(mf OTS).

Development of Materials for Hanford Reactors. Hot-hardness and grain size studies of U–Al and U–Zr alloys for slugs are reported. Other studies on the creep properties of annealed and cold-worked Zircaloy-2 and cladding with Zr are described. Developments for Al-Clad Fuel Elements. Inclusions in and mechanical properties of dingot-U tubes were investigated. Plant Assistance to MCW. The studies reported are: comparison of thermal activities of UO_3 from three sources; decomposition of UO_3 in air; electrical conductivity of UO_2; and corrosion of Ti and stainless steel. Development of a salt bath for U heat treatment continued. General Fuel Element Development. The bend strength and crystal size of sintered BeO compacts was studied along with surface areas of $Be(OH)_2$ vs. density of BeO made from it. The mechanical properties of U–Cr and U–Cr–Mo and the hardness of fissium alloys were investigated. Studies of Zr–U Alloys. The corrosion, radiation stability and heat treatment of Zr–U alloys were investigated. Corrosion Studies of Zr. The mechanism of corrosion of Zr is discussed, and a comparison of the reaction rates of H_2 and H_2O vapor with several Zr alloys at 400°C was made. Reactor Materials Development. The investigations reported are: Zr heat treatment; and kinetics of the Zr–UO_2 reaction. Physical Metallurgy. Studies were made of the quenching and aging of U–Ti alloys, air-oxidation rates for Nb alloys, and uranium reactions with hydrogen. Developmental Studies for the PWR. Some emissivity measurements on Zircaloy-2 and reaction rates of Zircaloy-2 with steam are given. Data from corrosion tests of UO_2 fuel element bodies in 750°F steam and from thermal fracture tests of UO_2–BeO bodies are presented and discussed. (T.R.H.)

12318 CF-56-1-50
Oak Ridge National Lab., Tenn.
PILOT PLANT PREPARATION OF THORIUM OXIDE. W. H. Carr. Jan. 4, 1956. Decl. Mar. 13, 1957. 27p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

ThO_2 is prepared in the Thorex pilot plant by converting thorium nitrate to thorium oxalate, then calcining the oxalate to the oxide. Reagent-grade oxalic acid is added to a thorium nitrate solution at 40°C, precipitating thorium oxalate. After agitation for one hour, the slurry is filtered and the oxalate washed. The oxalate is calcined at 370, 520, and 800°C. The resulting ThO_2 is blended and packed for shipment. (auth)

12319 CF-56-1-128
Oak Ridge National Lab., Tenn.
ANCO PROGRESS REPORT FOR MONTH OF JANUARY

1956. J. S. Drury. Jan. 27, 1956. Decl. Mar. 13, 1957. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Vapor pressure data for anisole–BF_3 mixtures were extended to include BF_3/anisole ratios of 0.55, 0.92, and 1.00. The temperature-pressure relationship of these and previously studied compositions is shown. An approximate melting point of 1 to 2°C was observed for the 1:1 complex, as compared with the literature value of −12 to −13°C. Progress is briefly reported on the laboratory-scale ANCO system and the reflux facility. (L.T.W.)

12320 CF-56-5-24

Oak Ridge National Lab., Tenn.

CONCENTRATED SALT SOLUTIONS FOR REACTOR FUEL MEDIA OR HEAT EXCHANGER FLUIDS. C. H. Secoy. May 4, 1956. Decl. Mar. 13, 1957. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The vapor pressures of several concentrated salt solutions have been measured over the temperature range 200 to 400°C. Solutions of either $LiNO_3$ or $Ca(NO_3)_2$ show some promise for application as primary heat transfer media for solid fuel element reactors as well as for a fuel-bearing material for homogeneous reactors. (auth)

12321 CF-56-5-197

Oak Ridge National Lab., Tenn.

CHEMICAL TECHNOLOGY DIVISION, UNIT OPERATIONS SECTION MONTHLY PROGRESS REPORT [FOR] MAY 1956. W. K. Eister, J. T. Long, E. O. Nurmi, J. C. Suddath, and C. D. Watson. Decl. Apr. 12, 1957. 83p. Contract [W-7405-eng-26]. $13.80(ph OTS); $4.80(mf OTS).

Excer Process. The first successful reduction of UO_2F_2 to $UF_4 \cdot {}^3/_4\ H_2O$ in a P.V.C. Excer electrolytic cell is reported. Design changes and substitution of a phenolic for P.V.C. were found necessary. Some $UF_4 \cdot {}^3/_4\ H_2O$ dehydration runs are described. HR Fuel Reprocessing. Studies in development of hydroclones, testing of pumps, testing of high pressure flanges, testing of cell liner seals, and deposition of Zr in loops are reported. Plutonium Producer Blanket Processing. Tests of an all Ti hydroclone and design models of the heat exchanger, hydroclone, and sample valve are described. Power Reactor Fuel Reprocessing. The design, installation, and testing of various pieces of equipment is reported. Corrosion test results for Ti, Ta, and Pfaudler No. 53 glass lined steel in aqua regia, Inconel in HNO_3, and sensitized and unsensitized types 302 and 304 L stainless steel in boiling HNO_3 are given. (T.R.H.)

12322 ISC-69

Ames Lab., Ames, Iowa.

QUARTERLY SUMMARY RESEARCH REPORT FOR APRIL, MAY, AND JUNE 1949. W. E. Dreeszen. Nov. 28, 1949. Decl. Feb. 18, 1957. 34p. Contract W-7405-eng-82. $6.30(ph OTS); $3.00(mf OTS).

Progress made in production of Th, Ca, Be, Zr, and rare earths is summarized. Other research in radiochemistry, radiation detection and measuring instruments, and physics is briefly mentioned. (T.R.H.)

12323 KAPL-1495

Knolls Atomic Power Lab., Schenectady, N. Y.

METAL–WATER REACTIONS. H. M. Saltsburg. Apr. 2, 1956. Decl. Apr. 2, 1957. 28p. Contract W-31-109-eng-52. $0.25(OTS).

The role of the metal-water reaction in the course of a nuclear incident is qualitatively examined in an attempt to create a coherent phenomenological picture upon which one may base an evaluation of the hazards involved. The fundamental concept is that at some point in the course of the reaction, the fundamental nature of the reaction becomes governed by external hydrodynamical (and heat transfer) considerations rather than chemical considerations. It is postulated that this occurs in region beyond the melting point but far below the vaporization point of the metal. Based upon this concept, the loss of coolant accident as described by Lustman is reviewed and the analysis extended to the case of the nuclear runaway. The assumed temperature dependence of the reaction rate is shown to imply a less severe reaction than heretofore assumed, prior to vaporization of the metal. An experimental program is recommended to test the hypothesis advanced and an analytical program is considered based upon the phenomenological assumptions. (auth)

12324 KAPL-M-NEF-1

Knolls Atomic Power Lab., Schenectady, N. Y.

PRELIMINARY CONSIDERATIONS OF PHASE RELATIONS IN SYSTEMS OF DIPHENYL WITH TERPHENYLS AND OTHER AROMATIC HYDROCARBONS. Nancy E. French and Leo F. Epstein. Sept. 1, 1956. 59p. Contract W-31-109-Eng-52. $10.80(ph OTS); $3.90(mf OTS).

Binary and ternary mixtures of diphenyl, o-terphenyl, m-terphenyl, p-terphenyl, naphthalene, and phenanthrene were examined for eutectics which melted below 30°C. The calculations are shown, and the data used are given. (T.R.H.)

12325 M-913

Columbia Univ., New York. Substitute Alloy Materials Labs.

CONDUCTIVITY OF POLYMER-WATER MIXTURES DETERMINATION OF WATER IN POLYMER. Nestor Sabi. Aug. 10, 1944. Decl. Mar. 5, 1957. 3p. (100B-R-200). $1.80(ph OTS); $1.80(mf OTS).

In a study of the conductivity of complex B–water mixtures as a means of determining the water content of unknowns, it was found that the specific conductivity of solutions was sensitive to small variations in water content. It is assumed that one mol of H_2O replaces one mol of ether to give $BF_3 \cdot H_2O$. (F.S.)

12326 MCW-18

Mallinckrodt Chemical Works, St. Louis.

THE REMOVAL OF MOLYBDENUM FROM SOLUTIONS OF URANYL NITRATE PREPARED FROM PITCHBLENDE. A. E. Ruehle. Apr. 1, 1946. Decl. Mar. 27, 1957. 18p. Contract W-7405-eng-1. $0.30(OTS).

In processing pitchblende ore by HNO_3 digestion and subsequent ether extraction under acid conditions, the removal of Mo required special treatment. A study was made of the following methods of removal, with the indicated results: (a) Precipitation of Mo present as heteropoly acids with a cheap alkaloid or other nitrogenous organic compound. Removal was incomplete. (b) Retention of Mo in the raffinate by forming a complex between molybdic acid and a polyhydric alcohol such as mannitel. This succeeded but was more costly than other methods. (c) Retention of Mo in the raffinate by forming a complex between phosphate and Fe. This succeeded apparently because most of the ether extractable Mo is present as phosphomolybdic acid. This is a worthwhile alternative method to the one chosen. (d) Adsorption of the Mo polyacid from the ether extract with activated charcoal. This was very successful but was more costly and harder to adapt to plant practice than the method chosen. (e) Conversion of the Mo polyacid to molybdate in the ether extract and removal by washing. Sodium ethyl xanthate was used as reagent, the resulting compound being unstable in ether. Other impurities not yet washed out interfered. (f) Removal of Mo from the purified $UO_2(NO_3)_2$ solution by extraction as the xanthate. This was successful in laboratory experiments but would require additional columns; hence,

it was abandoned. (g) Neutralization of the purified $UO_2(NO_3)_2$ solution and subsequent re-extraction. This was completely effective, and had the advantage of safeguarding against other impurities which might not be completely removed by the first extraction. The neutralization, in practice carried out by steam sparging, was required anyway, prior to evaporation of the purified $UO_2(NO_3)_2$ solution, in order to reduce corrosion of the evaporation vessels. (L.T.W.)

12327 MCW-23

Mallinckrodt Chemical Works, St. Louis.

THE DISTRIBUTION OF BORON AND MOLYBDENUM IN THE RECOVERY OF NITRIC ACID AND CALCIUM NITRATE FROM RAFFINATES ORIGINATING WITH PITCHBLENDE. A. E. Ruehle. Apr. 1, 1946. Decl. Feb. 26, 1957. 8p. $0.25(OTS).

Recovery of HNO_3 and $Ca(NO_3)_2$ from the ether-extraction raffinate is planned. Experimental results are reported on (1) the distribution of B between the distilled HNO_3 and the residual raffinate concentration, (2) the conditions for precipitation of most of the cations from this concentrate, using lime as the precipitant, and the distribution of B and Mo under optimum precipitation conditions, and (3) the distribution of B in crystallization of $Ca(NO_3)_2$ from the lime precipitation filtrate. Analytical difficulties in the determination of B are discussed. The limiting and most probable percentages of B and Mo which would be returned to the system are given. (L.T.W.)

12328 MLM-498

Mound Lab., Miamisburg, Ohio.

GENERAL RESEARCH REPORT FOR JUNE 26 TO SEPTEMBER 18, 1950. (Radium Volume). Oct. 23, 1950. Decl. Mar. 28, 1957. 103p. Contract AT-33-1-gen-53. $0.60(OTS).

A process for the separation and subsequent purification of Ra from the K-65 (pitchblende) residue is described. First, Pb is partially extracted with 15% NaOH solution, and the residue treated with $NaOH-Na_2CO_3$ mixtures to convert the Ra–Ba sulfate to carbonate. After the removal of the remaining Pb by sulfate precipitation and further purification by precipitation of the Ra–Ba carbonates, the Ra is concentrated by fractional chromate precipitation. The Ra-rich $BaCrO_4$ can be dissolved in HNO_3 and adsorbed on the top of an ion exchange column and the Ra is then separated by elution of the column with ammonium citrate solutions. A two-step process for the decontamination of waste solutions is discussed. (For preceding period see MLM-475.) (C.W.H.)

12329 MonN-36

Clinton Labs., Oak Ridge, Tenn.

ACTIVITY FROM STAINLESS STEEL IN PILE WATER. Progress Report [for] November 30, 1945. R. B. Briggs, O. Sisman, and B. Manowitz. Dec. 11, 1945. Decl. Feb. 28, 1957. 13p. Contract W-7405-eng-39. $3.30(ph OTS); $2.40(mf OTS).

Water was passed thru a stainless steel tube installed in the Clinton pile to determine the sources of the activity present in exit water. It was found that most of the activity resulted from the corrosion or recoil of active atoms from the stainless steel and appeared that the recoil mechanism contributed the largest amount. The activity of greatest intensity was that from Mn^{56} derived from the stainless steel. Intensities of activities induced in the Cl_2 and Na dissolved in the H_2O were next greatest in that order. (auth)

12330 MonN-311

Clinton Labs., Oak Ridge, Tenn.

REPORT OF THE CHEMISTRY DIVISION FOR THE MONTHS MARCH, APRIL, AND MAY 1947. J. R. Coe and E. H. Taylor. June 24, 1947. Decl. Mar. 2, 1957. 221p. Contract W-35-058-eng-71. $39.60(ph OTS); $11.10 (mf OTS).

12331 NAA-SR-852(Rev.)

North American Aviation, Inc., Downey, Calif.

CHEMICAL DEVELOPMENT QUARTERLY PROGRESS REPORT [FOR] JULY–SEPTEMBER 1953. R. L. Loftness, ed. Dec. 7, 1953. Decl. Feb. 27, 1957. 33p. Contract AT-11-1-GEN-8. $6.30(ph OTS); $3.00(mf OTS).

Data on thermal and radiation properties obtained during this quarter, as well as data on previous experiments which have been analyzed during this quarter are presented. Statitron irradiations indicate that the most desirable compounds for application in the region 200 to 400°C are the terphenyls, biphenyl, and napthalene. Pyrolytic studies, in the absence of radiation, were made on 17 organic compounds in the temperature range 400 to 500°C. Visual comparisons of these samples indicate that para-tephenyl is the most stable, with meta- and ortho-terphenyl less stable in that order. However, further quantitative analyses will be made. Five convection loops of terphenyls in stainless steel of Vycor, covering a temperature range of 140 to 530°C, have also shown that only 2% decomposition of paraterphenyl occurred at 440°C in $8\frac{2}{3}$ days. (auth)

12332 NBL-118

New Brunswick Lab., AEC, N. J.

QUARTERLY PROGRESS FOR THE PERIOD ENDING JUNE 30, 1955. (Classified Section). C. J. Rodden. Sept. 1955. Decl. Mar. 1, 1957. 19p. $0.30(OTS).

Methods of reducing the boron content of synthetic, high-boron, UO_2 feeds, during their processing to UF_4 have been investigated. The boron content, initially present in UO_2 as sodium borate to the extent of 1000 ppm of boron to uranium, was lowered in the laboratory to 0.07 ppm by a 5 hr treatment with hydrogen and BF_3 followed by a 2 hr hydrofluorination to produce UF_4. The reduction step, alone, using 0.025 mol % BF_3 in the gas phase reduced the boron level from 1000 ppm to 5 ppm by what was postulated to be the evolution of boron oxyfluoride. The presence of the same amount of BF_3 in the gas phase during the hydrofluorination, depressed the volatilization of the boron compound from the UO_2. This is consistent with the theory that the boron was evolved as the trifluoride during this treatment. When boron was added as boric acid to the UO_2, its concentration was reduced appreciably during the reduction process without the use of BF_3. Operation was carried out at 2000 volts using the apparatus previously used for 440-volt operation. At this higher voltage, starting was easier, operation more stable, and the efficiency of energy utilization greater than at the lower voltage. An electrostatic precipitator for collecting the gas-borne boron, was designed and built into the reactor. It was shown to be qualitatively effective. The energy consumption per unit weight boron was determined. (auth)

12333 NLCO-578

Northwest Electro-Development Lab., Albany, Oreg.

ANNUAL SUMMARY REPORT ON THORIUM RESEARCH FOR THE PERIOD OCTOBER 1, 1954 TO JUNE 30, 1955. July 15, 1955. Decl. Feb. 28, 1957. 28p. For National Lead Co. of Ohio. Contract AT(30-1)-1156. Charge $0.35 (OTS).

The production of $ThCl_4$ by the chlorination of $Th(C_2O_4)_2$ and $Th(NO_3)_4$, reduction of $ThCl_4$ to Th, and consumable-electrode arc melting of Th were investigated. (C.W.H.)

12334 NLCO-651

National Lead Co. of Ohio, Cincinnati.

MOVING BED REACTOR PELLET DEVELOPMENT PROGRAM. (LABORATORY INVESTIGATION). Paul W. Henline, Albert J. Klee, and Edward J. Walter. May 31,

1956. Decl. Mar. 19, 1957. 64p. Contract AT(30-1)-1156. $0.50(OTS).

A laboratory investigation has established limiting moisture and temperature parameters for continuous mixing and extrusion of orange oxide–water mixtures. Limiting values were established by "set-time" and tack considerations. Means of measuring and adjusting these parameters were developed. (auth)

12335 NYO-1236

Hooker Electrochemical Co., Niagara Falls, N. Y.

THE CONVERSION OF DIMETHYL ETHER–BORON TRIFLUORIDE COMPLEX TO BORON TRIFLUORIDE. Anthony Loverde. May 27, 1954. Decl. Mar. 12, 1957. 16p. Contract AT(30-1)-1524. $3.30(ph OTS); $2.40(mf OTS).

The feasibility of carrying out both Step I and Step II in a single reactor with repeated use of one batch of CaF_2 in situ for at least ten cycles is demonstrated. Substantial advantages over the former two vessel process are shown. The BF_3 yield averages 94.6%, with the principle loss, 4.1%, occurring as a by-product oil. (auth)

12336 NYO-1240

Hooker Electrochemical Co., Niagara Falls, N. Y.

A STUDY OF THE EFFECT OF METHYL FLUORIDE RECYCLE ON THE DECOMPOSITION RATE OF POLYMER DURING FRACTIONATION. J. L. Hanner. June 1, 1954. Decl. Mar. 12, 1957. 11p. Contract AT(30-1)-1524. $3.30(ph OTS); $2.40(mf OTS).

The rate of thermal decomposition of dimethyl ether–boron trifluoride complex (polymer) at the atmospheric boiling temperature and the recycling of methyl fluoride gas were studied. (F.S.)

12337 NYO-5250

Mallinckrodt Chemical Works, St. Louis.

POTASSIUM HYDROXIDE RECOVERY FROM HIGH PRESSURE SCRUBBER WASTES. T. O. Anderson. Oct. 1951. Decl. Mar. 25, 1957. 16p. $3.30(ph OTS); $2.40(mf OTS).

Experiments are described which demonstrate the feasibility of a lime precipitation system. (T.R.H.)

12338 NYO-5258

[Mallinckrodt Chemical Works, St. Louis.]

A REPORT ON THE USE OF A HYDROFLUORIC ACID RECOVERY SYSTEM. William A. Oppold. Decl. Mar. 25, 1957. 6p. $0.25(OTS).

The considerable monetary saving that could be made by installing a HF recovery system at the fluorination plant is calculated. The proposed use of larger excesses of absolute HF to obtain a product more even in assay and bulk density would not be feasible economically unless a recovery system were installed. (auth)

12339 ORNL-607

Oak Ridge National Lab., Tenn.

CHEMISTRY DIVISION QUARTERLY PROGRESS REPORT FOR PERIOD ENDING DECEMBER 31, 1949. Mar. 7, 1950. Decl. Mar. 6, 1957. 210p. Contract W-7405-eng-26. $31.80(ph OTS); $9.30(mf OTS).

12340 TID-5209

New Brunswick Lab., AEC, N. J.

THE CONVERSION OF DIMETHYL ETHER–BORON TRIFLUORIDE TO POTASSIUM FLUBORATE (PAGES 1-14). Al[l]an R. Eberle. DETERMINATION OF HEAT CAPACITY OF DIMETHYL ETHER BORON TRIFLUORIDE COMPLEX (PAGES 15-17). L. C. Nelson, Jr. HEAT CAPACITY AT CONSTANT VOLUME Cv OF METHYL FLUORIDE (PAGES 18-20). L. C. Nelson, Jr. Sept. 15, 1953. Decl. Mar. 4, 1957. 20p. $4.80(ph OTS); $2.70(mf OTS).

12341 UCRL-769

California. Univ., Berkeley. Radiation Lab.

CHEMISTRY DIVISION QUARTERLY REPORT [FOR] MARCH, APRIL AND MAY 1950. June 30, 1950. Decl. Mar. 19, 1957. 75p. Contract W-7405-eng-48. $12.30(ph OTS); $4.50(mf OTS).

Progress is reported on the following projects: Cm metal preparation; vapor-phase hydrolysis of rare-earth chlorides; crystal structure of $NaYF_4$ and $NaGdF_4$; ion exchange separation of rare earths; action of Dowex A-1 resin on UO_2^{++} – HCl solutions; fission of medium-weight elements; study of At isotopes; beta-decay energy of Ac^{228}; natural occurrence of Pu; beta spectra of Am isotopes; mass spectrographic studies of Cu and Sr isotopes; syntheses of a variety of labeled organic compounds; preparation of cancer-inhibiting agents; paper chromatography of fatty acids, tritium cholesterol; incorporation of C^{14} in cholesterol and eggs; sucrose-synthesis intermediates during photosynthesis; phosphorylated photsynthetic intermediates; pH, temperature, and ethanol effects on photosynthesis; and CO_2 fixation by microörganisms. (T.W.S.)

12342 Y-B41-484

Carbide and Carbon Chemicals Co., Y-12 Area, Oak Ridge, Tenn.

MANUAL OF PROCEDURE FOR NORMAL ACCOUNTABILITY LABORATORY. R. C. McIlhenny, ed. Mar. 11, 1952. Decl. Mar. 9, 1957. 92p. Contract W-7405-eng-26. $15.30(ph OTS); $5.40(mf OTS).

The following procedures are outlined: colorimetric, fluorimetric, and potentiometric determinations of U; determination of N_2 in uranium oxides; analysis of UO_2SO_4 for N_2 and $SO_4^{=}$; turbidimetric determination of total halides, analysis of UO_2F_2 for F_2 and U; estimation of NO_3^{-}, and determination of phthalate. The routine sample preparation for U analysis and preparation of stock reagents are described. (C.W.H.)

ANALYTICAL PROCEDURES

12343 CF-56-7-118

Oak Ridge National Lab., Tenn.

DEVELOPMENT OF RADIOANALYTICAL METHODS FOR HRT. T. H. Handley and S. A. Reynolds. July 23, 1956. Decl. Mar. 12, 1957. 11p. Contract [W-7405-eng-26.] $3.30(ph OTS); $2.40(mf OTS).

Radiochemical methods developed for HRT analyses are given. These include radiometric methods for Cs, Cu, Nb, P, and S. The fission product, induced, and heavy element activities to be found in "soup" are tabulated. (T.R.H.)

12344 K-789

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

APPLICATION OF TRIBUTYL PHOSPHATE EXTRACTION OF URANIUM TO WORKS LABORATORY SAMPLES. T. W. Bartlett. July 26, 1951. Decl. Feb. 12, 1957. 11p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

A tributyl phosphate extraction procedure for the gravimetric determination of U is described. Carbon tetrachloride was used to remove small amounts of TBP before precipitation in order to avoid contamination of the uranous-uranic oxide with phosphate. With samples in the range 3 to 10 grams of U per liter, the precision, expressed as the 95% symmetric confidence interval, was ± 1% of the amount present. Several other procedures for the removal of TBP proved to be unsatisfactory. (auth)

12345 KAPL-M-JLM-1

Knolls Atomic Power Lab., Schenectady, N. Y.

DETERMINATION OF URANIUM IN STAINLESS STEEL

ELECTROLYTIC-VOLUMETRIC. J. L. Marley and C. J. Kiley. Oct. 1, 1956. 6p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The sample is dissolved in HCl–HNO_3 mixture, fumed with $HClO_4$, and electrolyzed with an Hg cathode to remove the stainless steel constituents. The U is reduced in a Jones reductor and titrated with $K_2Cr_2O_7$ using sodium diphenylamine sulfonate as indicator. (auth)

12346 LA-1843(Del.)
Los Alamos Scientific Lab., N. Mex.
THE POLAROGRAPHIC BEHAVIOR OF VARIOUS METAL IONS IN PLUTONIUM SOLUTIONS. C. G. Warren. July 1953. Decl. with deletions Mar. 14, 1957. 26p. Contract W-7405-eng-36. $4.80(ph OTS); $2.70(mf OTS).

The reported procedures for the polarographic determination of uranium, vanadium, and titanium in plutonium were investigated to ascertain if they could be used to determine other common metals in plutonium. It was found that the procedure using hydroxylamine hydrochloride to reduce plutonium to the (III) oxidation state could be used to determine bismuth, platinum, rhodium, copper, tin, lead, thallium, indium, and cadmium. The procedure using zinc and zinc amalgam in hydrochloric acid to reduce the plutonium to the (III) oxidation state is quite limited, but it might be used to determine molybdenum. (auth)

12347 NBL-102
New Brunswick Lab., AEC, N. J.
DETERMINATION OF BORON 10 BY NEUTRON ABSORPTION. J. E. Hudgens, L. C. Nelson, R. C. Meyer, and C. Zyskowski. Dec. 1954. Decl. Mar. 4, 1957. 23p. $4.80 (ph OTS); $2.70(mf OTS).

A rapid neutron absorption method for the determination of B^{10} in samples obtained from the Boron Metal Project was developed. Small samples were used, a minimum of sample preparation was required, and the system was free of "memory." The B^{10} content of methyl ether–boron trifluoride complex was determined with a standard deviation of 0.4 at. % in the range of 17 to 30 at. % B^{10}. The method is applicable to the determination of all of the isotopic concentrations which will be produced in the process for the separation of B^{10} from B^{11}. (auth)

12348 NBL-131
New Brunswick Lab., AEC, N. J.
SUMMARY OF THE RESULTS OF THE GENERAL ANALYTICAL CONTROL PROGRAM FOR GREEN SALT, JANUARY 1, 1956–JUNE 30, 1956. C. J. Rodden. Oct. 1956. Decl. Mar. 16, 1957. 25p. $4.80(ph OTS); $2.70(mf OTS).

Comparative analytical results of UF_4 produced by Mallinckrodt and National Lead are presented. (T.R.H.)

12349 NYO-3798
Metal Hydrides Inc., Beverly, Mass.
DETERMINATION OF OXYGEN IN URANIUM AND URANIUM HYDRIDE BY REACTION WITH BROMINE TRIFLUORIDE. Sidney Johnson, David L. Henry, and M. Douglas Banus. Apr. 20, 1954. Decl. Mar. 28, 1957. 18p. Contract AT(30-1)-1350. $0.30(OTS).

The convenient procedure for the direct determination of the combined O_2 and N_2 content of U and UH_3 is described. The U or UH_3 is reacted with BrF_3 at ~80°C to evolve O_2 and N_2, which are measured tensimetrically. Using a sample of approximately one gram, the precision is ± 0.01% for U and ± 0.03% for UH_3. (auth)

12350 NYO-5061
Mallinckrodt Chemical Works, St. Louis.
AN INVESTIGATION OF SOME FACTORS AFFECTING THE ASSAY OF X (U) MATERIALS AND OF SOME SHORT ASSAY METHODS. G. L. Martin. Nov. 6, 1944. Decl. Mar. 30, 1957. 10p. $1.80(ph OTS); $1.80(mf OTS).

The effect of vanadate, molybdate, nitrate, ferric, and mercurous ions on the volumetric determination of U (ceric sulfate and ferroin) was investigated. Only mercurous ion had any effect, tending to be carried down as Hg from the Jones Reductor. (T.R.H.)

12351 NYO-5223
Mallinckrodt Chemical Works, St. Louis.
THE SHOTGUN TEST. Apr. 1, 1948. Decl. Mar. 7, 1957. 20p. Contract W-7405-eng-1. $0.30(OTS).

The purpose of the "shotgun test" is presented. Procedures are outlined for sampling UO_2 and related compounds, for the solution of the material and for successive extractions. Special precautions which must be observed while performing the test and directions for drying and igniting the residues and for keeping records and shipping final samples are presented. Specifications for 38° baume HNO_3 and ethyl alcohol are tabulated. Graphs for determining the volume of 38° baume HNO_3 recommended for dissolving standard shotgun samples of UO_2 and related compounds, and drawings of some of the equipment used in the test are shown. (auth)

12352 Y-301
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
ANALYTICAL LABORATORY PROCESS IMPROVEMENT REPORT [FOR] NOVEMBER 1948. Dec. 14, 1948. Decl. Mar. 7, 1957. 8p. Contract W-7405-eng-26. $1.80 (ph OTS); $1.80(mf OTS).

Research was continued on spectrographic and wet chemical methods for the determination of rare earths in U and UF_4, Ca in Mg salts, and Al in uranium. Spectrographic samples of CaO were prepared. (C.W.H.)

GRAPHITE

12353 A-4046
[Ames Lab., Ames, Iowa.]
MACHINING GRAPHITE AND SPECIAL OPERATIONS. C. F. Gray. Dec. 1945. Decl. Feb. 14, 1957. 14p. $3.30 (ph OTS); $2.40(mf OTS).

The fabrication of graphite into crucibles, molds, and miscellaneous parts for U melting and casting is summarized. Machining, sawing, shaping, drilling, finishing, tapping, and threading are discussed. (T.R.H.)

LABORATORIES AND EQUIPMENT

12354 A-2362
[Standard Oil Co. of Indiana, Chicago.]
EXPERIENCE IN THE USE OF STEDMAN PACKING. H. B. Higgins, T. G. Stack, J. E. Wolf, and A. L. Conn. Jan. 28, 1946. Decl. Feb. 12, 1957. 54p. Contract W-7418-eng-41. $9.30(ph OTS); $3.60(mf OTS).

Experience in the use of monel Stedman packing in a multicolumn superfractionation unit is described. (T.R.H.)

12355 CF-55-11-102
Oak Ridge National Lab., Tenn.
CHEMICAL EXAMINATION OF COLD TRAP FROM INTERMEDIATE HEAT EXCHANGER TEST STAND NO. 1. J. C. White. Nov. 17, 1955. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The oxide remaining in the cold trap of the NaK system was analyzed and the results are given and discussed. (T.R.H.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

12356 CF-56-11-29
Oak Ridge National Lab., Tenn.
TRIP TO THE BUREAU OF MINES, ALBANY, OREGON, REGARDING RARE EARTH ALLOY DEVELOPMENT. C. F. Leitten, Jr. Nov. 5, 1956. Decl. Mar. 13, 1957. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80 (mf OTS).

This brief outline of gadolinium metallurgy and application in reactor control rods includes separation of the metal from its oxide and preparation and fabrication of various gadolinium alloys. (L.T.W.)

SEPARATION PROCEDURES

12357 ANL-WAR-SL-1140
Argonne National Lab., Lemont, Ill.
SELECTION OF OPTIMUM FLUORINATING AGENT FOR FUSED-SALT PROCESS. G. E. Goring. Dec. 26, 1956. Decl. Mar. 11, 1957. 21p. Contract [W-31-109-eng-38]. $4.80(ph OTS); $2.70(mf OTS).

Qualitative consideration of flowsheets using BrF_3, BrF_3-BrF_5, BrF_5, and ClF_3 showed that BrF_3-BrF_5 would afford the most realistic comparison with elemental F_2. Then, using a plant capacity of 100 STR cores per year as a basis, an economic comparison between the F_2 and BrF_3-BrF_5 systems was made. It was shown that the F_2 system could effect a saving on the order of $90,000 per year in such a plant, due mainly to lower manpower requirements. Differences in capital charges between the two alternates would be relatively minor, and differences in chemicals and utilities costs would be negligible. (auth)

12358 BMI-252
Battelle Memorial Inst., Columbus, Ohio.
MINERALOGICAL EXAMINATION OF PITCHBLENDE CONCENTRATES AND NITRIC ACID DIGEST RESIDUES. D. W. Scott, O. F. Tangel, and A. C. Richardson. Feb. 9, 1951. Decl. Feb. 14, 1957. 26p. Contract AT-30-1-GEN-228. $0.35(OTS).

The results are given of a cursory examination with the petrographic microscope of samples of pitchblende concentrates and residues to study the relationship between the mineral composition of the samples and the filterability of the residues. Only a few of the minerals present were positively identified. However, information was obtained on phases in both the concentrates and the residues that would have a marked effect on filterability. (auth)

12359 BMI-955
Battelle Memorial Inst., Columbus, Ohio.
REFINING OF THORIUM BY SOLVENT EXTRACTION. R. A. Ewing, S. J. Kiehl, Jr., and A. E. Bearse. Oct. 19, 1954. Decl. Mar. 1, 1957. 70p. Contract W-7405-eng-92. $0.50(OTS).

Thorium extractions up to 99.99 + % were obtained by extraction of mantle-grade $Th(NO_3)_4$ with 30% TBP-70% Solvesso 100, using nitric acid salting. Rare earths were undetectable in the purified thorium. Data are presented on the re-extraction of thorium from organic extracts containing from 0.1N to 0.4N free HNO_3. Critical thorium concentrations for phase separation have been determined at 25°C for TBP-kerosene mixtures containing from 10 to 50% TBP; the concentration is approximated by the ratio 4 TBP: + $Th(NO_3)_4$ + $\frac{1}{6}$ HNO_3. The critical concentration decreases with increasing acidity, and increases with increasing temperature. Data are also presented on critical thorium concentrations for 30 and 40% TBP at 45 and 65°C. Rare earth contents of various thorium streams are shown, including those from the processing of Brazilian thorium sludge. (auth)

12360 BMI-JDS-169(Sect.I)
Battelle Memorial Inst., Columbus, Ohio.
RECOVERY OF THORIUM AND URANIUM FROM MONAZITE SANDS. Section I [of] Quarterly Report [for] November 15, 1948 to February 15, 1949. A. E. Bearse, E. G. Bohlmann, G. D. Calkins, R. B. Filbert, Jr., and J. B. Fishel. Feb. 16, 1949. Decl. Feb. 15, 1957. 74p. Contract AT-30-1-Gen-228. $12.30(ph OTS); $4.50(mf OTS).

Preliminary studies on the treatment of U and Th bearing monazite sands with strong NaOH at elevated temperatures proved to be an excellent method for breaking up the mineral and removing the phosphate from it. The resulting mixture of Th, U, and rare earth oxides could then be dissolved in HNO_3 to provide a solution suitable for solvent extraction. Data on solvent extraction, filtration, and precipitation are included. (W.L.H.)

12361 CCCO-131
Catalytic Construction Co., Philadelphia.
SURVEY OF PROCESSING METHODS FOR THE PRODUCTION OF THORIUM METAL FROM MONAZITE SAND AND THORIUM NITRATE. Job No. 3500. H. Harold Bulkowski and John B. Maerker. Apr. 23, 1951. Decl. Mar. 19, 1957. 37p. $10.80(ph OTS); $3.90(mf OTS).

Cost estimates for two types of Th producing plants are offered. One utilizes $Th(NO_3)_4$ as raw material, the other uses monazite sand. Final processing schemes and plant designs are not fixed, so the estimates represent maximum costs. Recommendations for research and development of Th producing methods are given. (T.R.H.)

12362 CF-50-2-55
[Oak Ridge National Lab., Tenn.]
PROCESS FOR THE RECOVERY OF U^{235} REACTOR FUEL FOR ARCO CHEMICAL AREAS. C. E. Larson. Feb. 7, 1950. Decl. Feb. 13, 1957. 9p. Contract [W-7405-eng-26]. $0.25(OTS).

A description of the proposed 25 Process for the recovery and decontamination of U^{235} from irradiated reactor fuel elements is presented. Chemical flowsheets are included. (C.W.H.)

12363 CF-56-3-52(Del.)
Oak Ridge National Lab., Tenn.
25 PROCESS: REMOVAL OF URANIUM OXIDE PARTICLES FROM CAUSTIC DISSOLVER SOLUTION. Terminal Report. T. A. Arehart and C. W. Hancher. Mar. 12, 1956. Decl. with deletions Mar. 14, 1957. 7p. Contract [W-7405-Eng-26]. $1.80(ph OTS); $1.80(mf OTS).

In preliminary studies, small-scale batch centrifugation was a satisfactory method of separating the uranium solids formed in caustic dissolution of Al-U alloy from the suspending medium. Neither continuous centrifugation nor filtration was able to separate the U with losses as low as the desired 0.1%. (auth)

12364 CF-56-3-129
Oak Ridge National Lab., Tenn.
CHEMICAL PROCESSING OF TWO-REGION THERMAL BREEDER REACTORS. F. R. Bruce. Mar. 22, 1956. Decl. Apr. 17, 1957. 27p. Contract [W-7405-eng-26]. $0.35(OTS).

12365 CF-56-8-167
Oak Ridge National Lab., Tenn.
DAREX: HEP DESIGN AND RECOMMENDATIONS. C. E. Guthrie. Aug. 23, 1956. Decl. Mar. 19, 1957. 10p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The dilute aqua regia (Darex) system for processing

stainless steel fuel elements consists of a continuous dissolution and chloride distillation system followed by a batch feed adjustment. The preliminary design is presented along with an outline of the development work required before a final design is possible. (auth)

12366 CF-56-8-200
Oak Ridge National Lab., Tenn.
A PROPOSED FUEL ELEMENT DESIGN TO FACILITATE REPROCESSING BY THE HERMEX METHOD. O. C. Dean. Aug. 31, 1956. Decl. Apr. 1, 1957. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A fuel element design is reported which will facilitate reprocessing by the Hermex method. A can, positioned vertically in the reactor, is to be filled with small rods, wires, or pellets of U and the voids filled with molten Na. The ends of the cans should be so equipped that they can be remotely removed without destruction, in order to discharge the contents to a Hermex reprocessing vessel. The fuel element is to be surrounded by another tube which provides a channel for Na coolant. A gas space should be provided at the top of each element connected to a header to serve as a pressure relief and as a bleed for fission product gases. (L.T.W.)

12367 CF-56-10-41
Oak Ridge National Lab., Tenn.
ZIRCEX: HEP DESIGN AND RECOMMENDATIONS. C. E. Guthrie. Oct. 8, 1956. Decl. Mar. 13, 1957. 14p. Contract [W-7405-eng-26.] $3.30(ph OTS); $2.40(mf OTS).

The high-temperature gaseous hydrochlorination (Zircex) system for processing Zr-containing fuel elements consists of a batch hydrochlorinator followed by a batch aqueous feed adjustment tank. The preliminary design is presented along with an outline of additional development work required and alternate processes which must be considered. (auth)

12368 CF-56-11-27
Oak Ridge National Lab., Tenn.
THOREX PILOT PLANT: BENCH TESTS ON RESIN SORPTION COLUMNS FOR THE NEW URANIUM ISOLATION SYSTEM. J. H. Walker. Nov. 8, 1956. Decl. Mar. 12, 1957. 15p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Bench tests were conducted on new ion exchange equipment installed in the Thorex pilot plant for the isolation and removal of U and Th from the process. Variables studied include the following: pressure drop through the column and bed expansion vs. volumetric flow rate of water, maximum bed contraction when treated with 6M HNO_3, and loss of resin from the column through the retaining-plug screen and Teflon gasket. A Th column was loaded to maximum capacity with Th to determine the resin-bed contraction at this condition. (L.T.W.)

12369 CN-2657
California. Univ., Berkeley. Radiation Lab.
THE SOLVENT EXTRACTION OF Pu(IV) BY TRIFLUOROACETYLACETONE. H. W. Crandall, J. R. Thomas, and J. C. Reid. Jan. 15, 1945. Decl. Feb. 19, 1957. 10p. Contract W-7405-eng-48B. $1.80(ph OTS); $1.80(mf OTS).

Certain variables of the extraction step of the proposed solvent extraction process using TFA have been investigated. The extraction of Pu^{4+} by TFA in benzene was found to vary with the time of shaking of the benzene and aqueous layers. Initially the extraction coefficient into benzene rose to a maximum within one or two minutes after which it rapidly fell off to $\frac{1}{10}$ to $\frac{1}{5}$ of its peak value. It was established that the drop from this peak value was due to some change in the TFA and not of the Pu^{4+}. After 15-20 minutes of shaking, the extraction coefficient is relatively constant except that a very slow reduction of Pu^{4+} to Pu^{3+} was observed. Reproducible values of the extraction coefficient were determined under a variety of conditions as a guide to the selection of favorable extraction conditions. The hydrolysis of TFA in alkaline solution is described. In acid solution the TFA appears to set up a reversible equilibrium with some other substance which has not been identified. (auth)

12370 CN-2823
[Clinton Labs., Oak Ridge, Tenn.]
THE COPRECIPITATION OF THE TRIVALENT RARE EARTHS WITH BISMUTH PHOSPHATE. Report for Period March 1 to May 15, 1945 on Problem Assignment CX3-5. Part II. L. S. Meyers, Jr. June 8, 1945. Decl. Apr. 4, 1957. 15p. Contract W-7405-eng-39. $3.30(ph OTS); $2.40(mf OTS).

Lanthanum, Ce, Pr, Eu, and Y were carried to nearly the same extent by α-$BiPO_4$ when precipitation was brought about by rapid addition of a 5N HNO_3 solution of $BiPO_4$ containing rare earth tracer to 0.025M H_3PO_4 at 75°C. The rare earth distribution, as shown by fractional dissolution of the precipitate, was nearly homogeneous, permitting calculation of the Berthelot-Nernst distribution constants. Values ranged from 0.001 to 0.0025. Lanthanum, Ce, and Pr were carried to essentially the same extent by β-$BiPO_4$ when the precipitation of the β form was carried out by a 70 hr digestion of an α-$BiPO_4$ precipitate with an initial homogeneous rare earth distribution. The distribution in the resulting precipitate was neither homogeneous nor logarithmic. Yttrium was carried to a lesser extent under these conditions, presumably because it forms a stable tetragonal phosphate which is not isomorphous with the stable monoclinic β-$BiPO_4$. Interpretation of fractional dissolving experiments involving α-$BiPO_4$ is complicated slightly by the partial conversion to β-$BiPO_4$. Since β-$BiPO_4$ dissolves much more slowly than α-$BiPO_4$, its presence leads to an apparent enrichment in the last fractions. (auth)

12371 HW-19303
Hanford Works, Richland, Wash.
PHYSICAL PROPERTIES OF THE SYSTEM URANYL NITRATE–ALUMINUM NITRATE–NITRIC ACID–WATER–HEXONE. PART VI. DISTRIBUTION COEFFICIENTS OF PLUTONIUM (IV) NITRATE. C. Groot, I. M. Rehn, and C. M. Slansky. Dec. 1, 1950. Decl. Mar. 28, 1957. 16p. Contract W-31-109-eng-52. $0.30(OTS).

12372 HW-40250
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
A KINETIC STUDY OF THE FLUORIDE CATALYZED NITRIC ACID DISSOLUTION OF THORIUM METAL. C. A. Goodall, J. L. Hepworth, R. L. Moore, and R. A. Watts, Jr. Nov. 17, 1955. Decl. Apr. 4, 1957. 35p. Contract W-31-109-Eng-52. $0.35(OTS).

The penetration rates of Th by boiling HNO_3 were measured as a function of the concentration of fluoride catalyst and of HNO_3. Dissolved Th and Al were found to inhibit the reaction. Thoria exhibited penetration rates much lower than those of Th metal. In addition to the specific rate measurements, pot type batch dissolvings were carried out to estimate plant time cycles. An empirical mathematical equation was devised which correlates the results of these batch dissolvings and facilitates application of the data to other types of dissolvers. (auth)

12373 IDO-14408
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
RECOVERY OF FISSION PRODUCTS FROM CALCINED

FIRST CYCLE SOLVENT EXTRACTION WASTES. E. S. Grimmett. June 26, 1956. 28p. Contract AT(10-1)-205. (PTR-86). $4.80(ph OTS); $2.70(mf OTS).

Investigations are reported which show that in calcination of reactor fuel wastes at 400°C the long-lived activities (Cs^{137}, Sr^{90}, Pm^{147}, and Ce^{144}) remain in the inert calcined portion. Leaching would effect a rough separation of valuable fission products. (T.R.H.)

12374 K-725

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

LABORATORY SCALE DECONTAMINATION OF PILE IRRADIATED URANIUM USING CHLORINE TRIFLUORIDE. R. A. Gustison, S. T. Benton, E. J. Barber, and H. A. Bernhardt. Mar. 1, 1951. Decl. Mar. 27, 1957. 28p. Contract W-7405-eng-26. $0.30(OTS).

A laboratory scale process was developed whereby U irradiated in the ORNL pile for 30 days at a flux of 5×10^{11} neutrons/cm^2/sec and cooled 90 days can be decontaminated to less than 20% of the beta-gamma activity of normal U. The Pu concentration is reduced below the limits of detection. The process involves the fluorination of the irradiated U metal to UF_6, the regeneration of ClF_3 from its reduction product by circulation of the product gases and F_2 over a catalyst and a two-step distillation of the UF_6 to free it from the fluorinating mixture, fission product fluorides, and PuF_4. The Pu appears to be oxidized to the nonvolatile trivalent or tetravalent state. Irradiated U cooled 7, 30, and 60 days was also investigated. (auth)

12375 KAPL-795(Del.)

Knolls Atomic Power Lab., Schenectady, N. Y.

AN INVESTIGATION OF THE $KMnO_4$–MnO_2 HEAD-END PROCEDURE FOR THE REMOVAL OF RUTHENIUM AND NIOBIUM–ZIRCONIUM. I. A PILOT-SCALE STUDY OF THE PROCEDURE WITH NATURAL URANIUM. J. K. Davidson, J. H. Holmes, and J. F. LaBonte. Aug. 22, 1952. Decl. with deletions Mar. 6, 1957. 30p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

The results of a pilot-scale study with natural U to investigate the variables in the Purex head-end treatment are given. A simplification of the procedure is sought. (T.R.H.)

12376 KLX-1207

Kellex Corp., New York.

PROGRESS REPORT [FOR] SEPTEMBER 1950. Job 23. Oct. 9, 1950. Decl. Mar. 26, 1957. 33p. Contract AT(30-1)848. $6.30(ph OTS); $3.00(mf OTS).

Work has continued on studies to obtain a mechanically suitable extraction system for use with low grade ore slurries. Results of a series of batch adsorption tests on a discard liquor from ore processing are reported. Results with ion exchange resins and aminized cotton cloth are detailed. Studies on countercurrent batchwise extractions of sulfated materials from ore residues have been made. Effects of temperature changes and results of flotation experiments are included. (auth)

12377 KLX-1218

Kellex Corp., New York.

PRELIMINARY PROCESS DESIGN FOR WASTE RESIDUE RECOVERY PLANT. Job 23. June 30, 1951. Decl. Apr. 3, 1957. 45p. Contract AT(30-1)848. $9.30(ph OTS); $3.60(mf OTS).

A basis is established for design and engineering of a projected waste recovery plant for the economic recovery of U as U_3O_8 from waste residues held in storage. The design is based on the sulfuric acid leach-ion exchange process. (F.S.)

12378 KT-70

Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.

THE OPERATION OF A PULSE COLUMN FOR THE PRODUCTION OF HAFNIUM-FREE ZIRCONIUM. J. B. Robinson and H. T. Tupper. May 26, 1950. Decl. Mar. 1, 1957. 13p. For Carbide and Carbon Chemicals Div. [K-25 Plant. Contract W-7405-eng-26, Subcontract 70]. $3.30(ph OTS); $2.40(mf OTS).

In order to produce Hf free Zr, hafnium thiocyanate complexes are being extracted from an aqueous fuel by an organic phase. The extraction is accomplished in an unpacked column, 60 feet high. An investigation is presented of the feasibility of decreasing the height of the column, while maintaining the same separation. A pilot-size pulse column was constructed and subjected to preliminary tests. Results are given of these tests. (W.L.H.)

12379 M-333(Pt. IV)

Linde Air Products Co., New York.

CONSTRUCTION, PROCESS AND OPERATION REPORT. STEP III. Oct. 1, 1946. Decl. June 10, 1957. 108p. Contract W-7401-ENG-14. $16.80(ph OTS); $5.70(mf OTS).

The specifications and description of the Ceramic Plant, Step III unit for conversion of UO_2 to UF_4 are given. The process and operation procedures are included. (T.R.H.)

12380 M-2765

Yale Univ., New Haven.

A CONCLUDING REPORT ON THE PREPARATION OF AAA ORE SOLUTIONS AND ON THE INVESTIGATION OF THE ETHER EXTRACTION OF URANYL NITRATE FROM THE RESULTING SOLUTIONS. Steven H. Brown, Herbert M. Clark, James L. Miller, Carolyn M. Brown, Albert L. Grunewald, and Robert P. Smith. May 1946. Decl. Mar. 8, 1957. 28p. $4.80(ph OTS); $2.70(mf OTS).

Pilot plant data are given for four ore digestions and their extractor runs. (T.R.H.)

12381 M-3027

[Du Pont de Nemours (E.I.) & Co.] Jackson Lab., Wilmington, Del.

TENTATIVE DYE WORKS PROCESS FOR THE DISPOSAL OF ACID PRESS CAKES FROM PRESS (3), C-100 SERIES. C. W. Maynard, Jr. July 1, 1943. Decl. Mar. 7, 1957. 6p. $1.80(ph OTS); $1.80(mf OTS).

12382 M-4525

Du Pont de Nemours (E. I.) & Co., Wilmington, Del.

THE RECOVERY OF URANIUM FROM BYPRODUCT SCRAP MATERIALS. Louis Spiegler. [1947?] Decl. Mar. 6, 1957. 71p. $0.55(OTS).

Processes, process controls and design data were developed for the almost quantitative (98.5 to 99%) recovery as peruranic acid ($UO_4 \cdot 2H_2O$) of the uranium values of byproduct scrap materials such as dross, slag, sodium uranate, uranium contaminated carbon, and scrap metal turnings such as turnings, offgrade biscuits and billets, sweepings, etc. The chemistry of the process and its controls were especially directed to the production of peruranic acid of high purity suitable for direct conversion to uranium nitrate and reprocessing to metal. (auth)

12383 M-4541

Linde Air Products Co. Tonawanda Lab., Tonawanda, N. Y.

PILOT PLANT OPERATIONS ON AFRICAN ORE. R. Wiesendanger. May 26, 1944. Decl. Mar. 8, 1957. 28p. $4.80(ph OTS); $2.70(mf OTS).

A detailed procedure for processing low-grade African ore is presented. Uranium extraction of 96% based on tails analyses is obtained. (auth)

12384 MCW-127

Mallinckrodt Chemical Works, St. Louis.

EFFECT OF THE URANIUM CONTENT OF "IN" ETHER UPON THE URANIUM CONTENT OF RAFFINATE. W. G. Weber. July 20, 1948. Decl. Mar. 28, 1957. 4p. $1.80 (nh OTS); $1.80(mf OTS).

An increase of 1.0 g of U per liter in the IN ether used for the extraction will cause an increase of 0.5 g of U per liter in the effluent raffinate. (W.L.H.)

12385 MITG-517

Massachusetts Inst. of Tech., Watertown, Mass.

Mineral Engineering Lab.

PROGRESS REPORT ON DOMESTIC ORES FOR NOVEMBER 16, 1949 TO DECEMBER 15, 1949. John Dasher. Dec. 15, 1949. Decl. Feb. 26, 1957. 8p. Contract AT-30-1-Gen-211. $1.80(ph OTS); $1.80(mf OTS).

Up to 97% uranium extraction has been obtained from Anaconda acid with monazite. Experiments on extraction of phosphoric acid with ether were conducted. The procedure for leaching superphosphates has been changed to insure the use of a saturated solution. A few solvents have been tested in place of ether for leaching. Acetone was superior to ether on unnitrated CX material. The Sunshine concentrates were cyanided with and without roasting in connection with acid leaching tests. For the photodisintegration of beryl, Sb^{124} is a suitable source of gammas. (auth)

12386 MLM-835

Mound Lab., Miamisburg, Ohio.

PILOT PLANT STUDIES OF THE FERROUS SULFIDE PROCESS FOR THE DECONTAMINATION OF PUREX-TYPE REACTOR WASTES. Final Report. T. Aponyi, W. Recher, P. J. Schauer, T. C. Tesdahl, J. Tullis, and J. Woeste. Apr. 17, 1953. Decl. Mar. 1, 1957. 46p. Contract AT-33-1-GEN-53. $0.35(OTS).

The ferrous sulfide ferrous hydroxide-calcium phosphate method for decontaminating high-salt-content reactor wastes was studied on a pilot-plant scale using as a feed a typical (Purex) reactor waste. Results obtained in the pilot plant duplicated to a large degree those obtained in laboratory tests. Waste streams with an activity level in the order of 5×10^6 counts per minute per milliliter (alpha plus beta) were processed, and an over-all decontamination factor of 2.7×10^2 was realized. Precipitates were separated from liquids by settling proceses. Total volume reduction of liquids to solids was 15.5 to 1. Modifications in the process promise to yield a decontamination factor of 4×10^4 and a volume reduction greater than 30 to 1. (auth)

12387 MonN-123

[Clinton Labs., Oak Ridge, Tenn.]

PROCESS DEVELOPMENT FOR CLINTON WASTE METAL RECOVERY. Problem Assignment Numbers 227-X16E and TX2-2. Final Report. May 15, 1946. Decl. Mar. 9, 1957. 63p. Contract W-7405-eng-39. $10.80(ph OTS); $3.90(mf OTS).

Laboratory development of a solvent extraction process for recovery of Clinton waste metal is summarized. (D.E.B.)

12388 MonN-136

[Clinton Labs., Oak Ridge, Tenn.]

PURIFICATION OF 25 FROM THE HETEROGENEOUS PILE. Progress Report [on] Problem Assignment TX5-11 for January 1, 1946 to June 10, 1946. W. H. Baldwin and W. K. Eister. Aug. 10, 1946. Decl. Mar. 2, 1957. 64p. Contract W-7405-eng-39. $10.80(ph OTS); $3.90(mf OTS).

Proposed flowsheets are presented for laboratory and semi-works processes for the separation and purification of U^{235} from the heterogeneous pile. Two alternate flowsheet processes are presented, one based on batch operation and the other on continuous extraction with a solvent. Both laboratory and semi-works data indicate that the metal nests containing the U^{235} can be dissolved satisfactorily in nitric acid using mercuric ion as the catalyst. (C.H.)

12389 MonN-359

[Clinton Labs., Oak Ridge, Tenn.]

THE CHEMICAL DEVELOPMENT OF A PROCESS FOR THE PURIFICATION OF U-235 FROM AN HOMOGENEOUS PILE. [Period covered] May 1, 1945 to Feb. 1, 1946. W. H. Baldwin. Aug. 7, 1947. Decl. Mar. 2, 1957. 29p. $6.30(ph OTS); $3.00(mf OTS).

A solvent extraction process for the recovery of U from homogeneous reactor fuel solutions is proposed. Flowsheet steps included moderator recovery by distillation, batch extraction of U, stripping by distillation of the solvent, extraction of non-volatile organics with benzene, formation of the carbonate-peroxide U complex, and evaporation to dryness. (C.W.H.)

12390 MonT-156(Del.)

[Clinton Labs., Oak Ridge, Tenn.]

PROCESS DESIGN REPORT—706-D BUILDING. J. T. Weills. Aug. 1, 1946. Decl. with deletions Feb. 28, 1957. 41p. Contract W-35-058-eng-71. $9.30(ph OTS); $3.60 (mf OTS).

A plant for the production of Ba^{140} was designed to isolate this fission species from ORNL Graphite Reactor metal. A wet-precipitation process was developed concurrent with design and construction based on the specifications that the product, $Ba(NO_3)_2$, be essentially free of ionic and γ-emitting impurities and contain less than 1 g of inert Ba. The assurance of success was based in large measure on the fact that a similar process was being used to make $BaCl_2$ on a temporary basis under research direction. This report covers the process design of the original installation, a description of facilities as of May 1945, and a résumé of glassware installations to make the chloride salt. Barium chloride was chosen after the first nitrate shipment was made because the nitrate was discovered to be unstable, the specifications on ionic impurities were made more stringent, and the chloride is more soluble than the nitrate. (auth)

12391 MonT-210

[Clinton Labs., Oak Ridge, Tenn.]

ION EXCHANGE RESINS IN SEPARATIONS INVOLVING URANIUM. Period [Covered] June 1, 1945–September 15, 1946. Problem Assignment Number TX5-11. G. P. Monet. Nov. 25, 1946. Decl. Mar. 7, 1957. 53p. Contract W-7405-eng-39. $9.30(ph OTS); $3.60(mf OTS).

Unit operations involved in the separations processes with ion exchange resins have been discussed. These operations have been applied to the development of separations processes for the decontamination and purification of U from the homogeneous pile, the heterogeneous pile, the separation of U from Th (233 purification and UX_1 preparation) and the separation of U isotopes. (auth)

12392 MonT-252

[Clinton Labs., Oak Ridge, Tenn.]

PURIFICATION OF 25 FROM THE HETEROGENEOUS PILE—PROBLEM ASSIGNMENT TX5-11. Progress Report for Period June 15, 1946 to December 1, 1946. F. R. Bruce. Feb. 14, 1947. Decl. Mar. 8, 1957. 24p. Contract W-7405-eng-39. $4.80(ph OTS); $2.70(mf OTS).

Progress is described on the laboratory development of a batch chemical process for the purification of U^{235} from the heterogeneous pile reactor unit. (auth)

12393 MonT-253
[Clinton Labs., Oak Ridge, Tenn.]
SEPARATION OF U^{233} FROM THORIUM. Progress Report [for] Period June 1, 1946 to March 15, 1947. Laboratory Problem Assignment No. TX5-11. F. L. Steahly. Decl. Mar. 7, 1957. 118p. Contract W-35-058-eng-71. $19.80(ph OTS); $6.30(mf OTS).

A process and a flowsheet for the recovery of U^{233} (23) from bombarded Th are presented. This process consists of: solution of Th metal, cooled 8 to 12 months, in HNO_3 catalyzed with HF; extraction of 23 with diisopropyl ether solvent; removal of Th impurity with a $Th(C_2O_2)_2$ by-product precipitation; concentration of the recovered 23 with a product uranyl thiocyanate acridine precipitation, followed by ignition of U_3O_8. In batch operation, maximum waste loss expected is 0.2%, and over-all determination factors expected for Th, fission products and Pa are 10^6 to 10^7, 10^3 to 10^4, and $\geq 10^4$, respectively. Metal cooled less than 8 months will be processed only if special need arises for Pa^{233} (13). The 13 can then be recovered in about 90% yield by extraction of the 23 aqueous waste with diisopropy carbinol containing 3% TTA (Thienyl Trifluoro Acetylacetone). Because of this shorter cooling time, a second 23 extraction cycle will be then added to provide further product decontamination. (auth)

12394 NYO-1157
Vitro Mfg. Co., Pittsburgh.
PROBLEMS OF REFINING URANIFEROUS RESIDUES. Progress Report [for] March 1953. H. Fleck and J. E. Summers. Apr. 15, 1953. Decl. Mar. 12, 1957. 18p. $3.30(ph OTS); $2.40(mf OTS).

An investigation is reported of the applicability and refinement of various procedures for the treatment and digestion of c-slags and other uraniferous residues for the recovery of U values and the recovery of U from bronze flux, placing emphasis on procedures which will not chemically alter the Cu and Sn media. (W.L.H.)

12395 NYO-5049
Mallinckrodt Chemical Works, St. Louis.
EXTRACT FROM "42-39 (UF_4) WET PROCESS GREEN SALT (UF_4) BROWN OXIDE (UO_2) PROCESS." Report No. 2. Mar. 30, 1944. Decl. Apr. 1, 1957. 7p. Contract [W-7405-eng-29]. $1.80(ph OTS); $1.80(mf OTS).

The bulk of wet process UF_4 is generally at least 100% greater than the bulk of dry process UF_4. In order to maintain the reduction bomb operation at the capacity possible with dry process UF_4, it was necessary to reduce the bulk of the wet process material. The results for methods used to bring about the bulk reduction are tabulated. Two methods are reported in which the yield and ignition temperatures were comparable to those obtained with regular dry process UF_4. Attempts to reduce wet process UF_4 without reducing its moisture content resulted in the charge igniting at a reasonable temperature but the U biscuit did not form. (auth)

12396 NYO-5094
Mallinckrodt Chemical Works, St. Louis.
CHANGES IN EXTRACTORS TO PREVENT EMULSIONS. Harold Yeager. Mar. 27, 1945. Decl. Mar. 8, 1957. 41p. Contract W-7405-eng-1. $7.80(ph OTS); $3.30(mf OTS).

Laboratory experiments were conducted on the ether extraction step in the UO_2 process, using a model glass extractor. Various changes and additions to the extractor were made to determine the best means to prevent "emulsion" formation; a mixture of ether and water solution of $UO_2(NO_3)_2 \cdot 6H_2O$ in which the ether and the water layer are not readily separable. Engineering details for changes in the plant extractor based on these experiments are discussed. Installation of these alterations and their effect on ether extraction efficiency emulsion formation, in productive capacity, and purification of ether solution is reported. (T.R.H.)

12397 NYO-5172
Mallinckrodt Chemical Works, St. Louis.
SOME FACTORS IN RAFFINATE PROCESSING TO RECOVER NITRIC ACID AND CALCIUM NITRATE. James L. Miller. Feb. 1946. Decl. Mar. 7, 1957. 17p. Contract W-14-108-eng-8. $3.30(ph OTS); $2.40(mf OTS).

Raffinate from the ether extraction is processed for HNO_3 and $Ca(NO_3)_2$ recovery. Optimum conditions for the process steps are determined and B and Mo contamination is investigated. (D.E.B.)

12398 ORNL-238
Oak Ridge National Lab., Tenn.
RECOVERY OF URANIUM FROM GRAPHITE SHAPES BY ELECTROLYTIC GRAPHITE DISINTEGRATION IN NITRIC ACID. L. W. Fromm. Feb. 24, 1949. Decl. Mar. 9, 1957. 25p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

An investigation was made of electrolytic disintegration as a means of recovery of U from graphite shapes. A literature search was made for information concerning the phenomena of swelling and disintegration of graphite anodes in solutions containing oxidizing ions. Several preliminary tests were run using natural-U-impregnated graphite samples and nitric acid leaches. Development work was carried out to determine the adaptability of the process to mass treatment of spent fuel units. A method whereby samples were stacked end to end in a vertical tank was found to be successful. By making the electrodes and leads into the bath of Ta, the essentially unidirectional current-conducting property of the surface oxide of Ta was utilized, with the result that rectification of alternating to direct current occurred within the bath, and the need for external rectifiers or other sources of direct current was eliminated. A suggested design for a production model of the stak type apparatus is given and its operation explained. Calculated U recovery data are included. (C.H.)

12399 ORNL-258
Oak Ridge National Lab., Tenn.
SOLVENT EXTRACTION RECOVERY OF URANIUM FROM METAL WASTE. C. V. Ellison, D. E. Ferguson, and T. C. Runion. June 1, 1949. Decl. Mar. 19, 1957. 5p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

A simple feasible solvent extraction process was developed for the recovery of U from metal waste. The procedure involves the solution of waste sludge to 3.0 to 5.0 N HNO_3, solvent extraction with 15% TBP–85% hexane, and subsequent stripping of U from the solvent with water. (F.S.)

12400 ORNL-625
Oak Ridge National Lab., Tenn.
LABORATORY DEVELOPMENT OF THE VERSENE PROCESS FOR THE PURIFICATION OF RADIOBARIUM BY ION EXCHANGE. E. Blanco and A. H. Kibbey. July 30, 1951. Decl. Mar. 8, 1957. 37p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

This report presents the laboratory development of the Versene and Nickel-Versene ion exchange processes for the purification of radioactive barium. (auth)

12401 ORNL-743(Del.)
Oak Ridge National Lab., Tenn.
APPLICATION OF THE PUREX PROCESS TO ORNL METAL WASTE RECOVERY. T. C. Runion and C. V.

Ellison. Aug. 24, 1950. Decl. with deletions Mar. 1, 1957. 32p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

12402 SEP-214

Sylvania Electric Products Inc. Atomic Energy Div., Bayside, N. Y.

STUDIES ON NON-AQUEOUS METHODS OF SEPARATION. S. Ruby. June 20, 1956. Decl. Mar. 1, 1957. 14p. Contract AT-30-1-GEN-366. $0.30(OTS).

The most promising approaches to non-aqueous fuel processing found were hydriding as a means of physical reconstitution of a damaged fuel (no fission-product separation effected) and hydrochlorination as a pre-solvent extraction treatment for U–Zr fuels. (auth)

12403 SOD-13

Standard Oil Development Co., Elizabeth, N. J.

EXPERIMENTAL STUDIES IN PLANT AND LABORATORY SCALE MIXER-SETTLER UNITS. Oct. 1, 1948. Decl. Mar. 5, 1957. 20p. Contract AT-30-3-Gen-3. $4.80 (ph OTS); $2.70(mf OTS).

The experimental work being carried out, on both a plant and laboratory scale, to develop a satisfactory design for a Redox mixer-settler extraction unit is reviewed. The plant scale unit (8 stages) has now been equipped with horizontally slotted baffles at the entrance and exit of the mixer compartment in order to build a fixed interface position into the unit. The height at which the horizontal slot is located determines the height of the interface. This construction makes the interface position very insensitive to gravity changes in the phases. Stirrer pumping action has been essentially eliminated by the symmetry of the mixing compartment. By applying a moderate tilt to the contractor, the interface position is affected only slightly by rather large changes in flow rate and stirrer speed. Uranium extractions in the plant scale equipment have indicated excellent hydraulic performance and extraction efficiency appears quite satisfactory. In the laboratory scale (15 stage) unit good extraction efficiency was obtained in both 1A and 1C extractions. Following these runs the internal arrangement of the unit was altered to permit operating with a fixed interface position. Good interface control was obtained with this system in a 1C extraction and satisfactory recovery of U from the hexone was obtained. (auth)

12404 TID-5191

New Brunswick Lab., AEC, N. J.

REPORT ON THE THORIUM PROGRAM FOR THE PERIOD ENDING JANUARY 18, 1952. Decl. Mar. 5, 1957. 18p. $3.30(ph OTS); $2.40(mf OTS).

Using a mixer-settler apparatus, tests were run to determine the extraction efficiency using nearly saturated thorium nitrate feeds and tributyl phosphate–Solvesso solvent acidified with HNO_3. It was found that the determination of rare earths in Th samples involves the precipitation of Th by hexamethylenetetramine. (J.E.D.)

12405 TID-10156

New Brunswick Lab., AEC, N. J.

QUARTERLY PROGRESS REPORT FOR THE PERIOD ENDING JUNE 30, 1952. C. J. Rodden. Dec. 24, 1952. Decl. Mar. 6, 1957. 144p. $0.80(OTS).

A study is made of the separation of Th from ThF_4 sludge, merits of carbonate leaching methods for recovery of U from by-product materials, separation of TBP from kerosene using 75% methanol, and removal of Ra from the filtrate of the ThF_4 precipitation using MgF_2, $CaCO_3$, and $BaSO_4$. Disproportionation of UF_4 up to 900°C, protective oil coating of machined U slugs and evaluation of oil coatings by accelerated corrosion tests, analysis of Th metal, flame photometry, and spectrochemical analysis of rare earths. An apparatus for the hydrofluorination of UO_2 is described. (J.E.D.)

12406 TID-10162

New Brunswick Lab., AEC, N. J.

QUARTERLY PROGRESS REPORT FOR THE PERIOD ENDING SEPTEMBER 30, 1952. C. J. Rodden. Decl. Mar. 20, 1957. 91p. $0.60(OTS).

An evaluation is made of the Ames process for the recovery of Th from monazite. The features considered were the H_2SO_4 consumption, preparation of the feed for solvent extraction, HNO_3 consumption, loss of Th in the raffinate, and purity of the product. High purity and recovery appear possible. Work on the development of a Th shotgun procedure was completed, and efficiencies of extraction are tabulated. The NaOH solubilization of the thorium phosphate sludge is discussed. Flame propagation in UF_6–H mixtures was studied. Experiments on the use of $CaCO_3$ to remove radium isotopes which occur in the Th decay series from the filtrate from a ThF precipitation were continued. Procedures for the determination of B in Th metal, of rare earths in Th metal, of N_2 in Th samples, and of C in Th metal are described. The determination of Be in its ores is also discussed. (W.L.H.)

12407 UCRL-400(Rev.)

California. Univ., Berkeley. Radiation Lab.

THE CHELATE PROCESS. V. INVESTIGATION IN HORIZONTAL EXTRACTORS. T. E. Hicks, B. Rubin, and T. Vermeulen. July 29, 1949. Decl. Mar. 18, 1957. 47p. Contract W-7405-eng-48. $7.80(ph OTS); $3.30(mf OTS).

The recovery of plutonium has been demonstrated in a laboratory countercurrent horizontal extractor using the TTA process. Using three extractive stages and two washing stages in each step, a recovery of 91% has been obtained in the chelation step and a recovery of 99.9+ percent in the de-chelation step. With five extractive stages, recoveries of 94 to 98% have been found for the chelation step. A calculation method has been developed in order to correlate these continuous-flow results with rate data for batch experiments. This correlation utilizes dynamic extraction coefficients that are calculated from the rate data and the equilibrium extraction coefficients. Values for column recovery of plutonium are predicted that are in agreement with the observed results. On the basis of this agreement, recovery and decontamination factors are predicted for a pair of center-fed extraction columns of seven stages each. (auth)

12408 Y-22

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

CLOSED-CYCLE BETA PROCESS. R. H. Adams, R. S. Lowrie and K. B. Brown. Sept. 24, 1947. Decl. Mar. 5, 1957. 97p. Contract [W-7405-eng-26]. $15.30(ph OTS); $5.40(mf OTS).

A new chemical recycle process for the Beta plant is described. This process involves washing of the calutron units with $Al(NO_3)_3$ solution, extraction of U from the machine wash with diethyl ether, and formation of UCl_4 by chlorination with hexachloropropene. (auth)

12409 Y-41

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

SIMPLE PROCESS SEPARATION FACTORS FOR THE SEPARATION OF URANIUM ISOTOPES BY CHEMICAL EXCHANGE. G. H. Clewett and W. B. Schaap. Oct. 16, 1947. Decl. Mar. 6, 1957. 31p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

12410 Y-163
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
RESEARCH AND DEVELOPMENT DIVISION, CHEMICAL DEVELOPMENT DEPARTMENT PROGRESS REPORT ON SPECIAL PROJECTS FOR THE MONTH OF APRIL, 1948. May 6, 1948. Decl. Mar. 18, 1957. 27p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

12411 Y-520
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
ELECTROMAGNETIC SEPARATION OF IRON 58. H. W. Savage and Boyd S. Weaver. Nov. 18, 1949. Decl. Mar. 5, 1957. 49p. Contract W-7405-Eng-26. $9.30(ph OTS); $3.60(mf OTS).

One gram of Fe enriched in Fe^{58} to 46.9% and having a ratio of Fe^{58} to Fe^{54} of 63 has been collected for the AEC. This comprehensive report covers the development work involved and a description of each step in the production cycle. (auth)

12412 Y-B46-114
Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.
DESCRIPTION OF PERMANENT ZIRCONIUM PLANT. [Sept. 1951]. Decl. Mar. 9, 1957. 13p. $3.30(ph OTS); $2.40(mf OTS).

Flowsheets and photographs of the permanent Zr plant at the Union Carbide Nuclear Co. Y-12 Area are included. Hafnium is removed from the commercial $ZrCl_4$ received by extraction into hexone–thiocyanate acid solution, and the resulting Zr solution is purified by phthalate precipitation. Zirconium phthalate is converted to $Zr(OH)_4$ by NH_4OH leaching, the $Zr(OH)_4$ is calcined to ZrO_2, which is chlorinated to $ZrCl_4$. This is reduced to the metal with Mg. (W.L.H.)

TRANSURANIC ELEMENTS AND COMPOUNDS

12413 LA-1390
Los Alamos Scientific Lab., N. Mex.
A DETERMINATION OF THE COEFFICIENT OF THERMAL EXPANSION OF ALPHA PLUTONIUM. R. O. Elliott and R. E. Tate. Mar. 3, 1952. Decl. Mar. 26, 1957. 19p. Contract W-7405-Eng-36. $0.30(OTS).

The coefficient of linear expansion of alpha Pu has been determined for the range −180 to +100°C by the silica-tube and dial-indicator method. Included are a detailed description of the apparatus and a discussion of the method. (auth)

12414 LA-1869
Los Alamos Scientific Lab., N. Mex.
SOME OBSERVATIONS ON THE REACTIVITY OF PLUTONIUM DIOXIDE. C. W. Bjorklund and Eugene Staritzky. Nov. 1, 1954. Decl. Oct. 23, 1957. 21p. Contract W-7405-Eng-36. $0.75(OTS).

The index of refraction of PuO_2 made by thermal decomposition of $Pu(C_2O_4)_2 \cdot 6H_2O$ gradually increases from a value < 1.9 to 2.40 as the decomposition temperature is increased from 150° to 1000°C. This change in refractive index parallels a gradual change in the x-ray-diffraction pattern from weak, diffuse lines for PuO_2 ignited at 150° to sharp, well-resolved lines for PuO_2 ignited at 1000°C. Similar results are observed for PuO_2 made by thermal decomposition of $Pu_2(C_2O_4)_3 \cdot 11H_2O$. The refractive index of PuO_2 made from Pu metal at 170°C is 2.40 and is not affected by further ignition at higher temperatures, although crystal growth does occur. The rate of solution of PuO_2 in an HCl–KI solution is greatest for samples prepared at low temperatures and decreases markedly for oxides ignited at higher temperatures. These observations have been interpreted to mean that ignition at higher temperatures causes a gradual perfection of the originally highly distorted and impurity-containing PuO_2 lattice obtained by low temperature decomposition of the oxalates and promotes the slow growth of crystallites. Both factors decrease the reactivity of the PuO_2. (auth)

URANIUM AND URANIUM COMPOUNDS

12415 ANL-5007(Del.)
Argonne National Lab., Lemont, Ill.
RECOVERY OF URANIUM FROM ORE CONCENTRATES. Irving Sheft, H. H. Hyman, and J. J. Katz. Mar. 1953. Decl. with deletions Mar. 5, 1957. 12p. Contract W-31-109-eng-3[8]. $3.30(ph OTS); $2.40(mf OTS).

The use of BrF_3 solutions was investigated for the preparation of purified UF_6 from ore concentrates. The best yields were obtained with the use of SbF_5 solutions in BrF_3, and less F was consumed in the case of previously hydrofluorinated samples. (auth)

12416 CF-51-11-66
[Oak Ridge National Lab., Tenn.]
DENITRATION OF URANYL NITRATE. Quarterly Report for Period August 10–November 10, 1951. V. J. Reilly. Nov. 13, 1951. Decl. Feb. 16, 1957. 5p. Contract [W-7405-eng-26]. $0.20(OTS).

Uranyl nitrate solution was concentrated prior to denitration by removal of water only. The composition during boildown where vapors of the azeotropic composition come off is at 85% $UO_2(NO_3)_2$ and 4.1% HNO_3. The freezing and boiling points for compositions near the end of boildown were determined. The freezing point rises much more rapidly than the boiling point. At 85% $UO_2(NO_3)_2$ and 4.1% HNO_3 the solution is metastable. Vapor-liquid equilibria were obtained for compositions near the end of boildown. From these data the number of theoretical plates for removal of water was obtained. (auth)

12417 CF-56-2-161(Del.)
Oak Ridge National Lab., Tenn.
REMOVAL OF CARBON FROM UF_4 PELLETS BY OXIDATION. L. M. Ferris. Feb. 29, 1956. Decl. with deletions Feb. 14, 1957. 22p. Contract [W-7405-Eng-26]. $3.30(ph OTS); $2.40(mf OTS).

All attempts were about 75% effective in removing 0.1 to 0.5 wt. % residual carbon from UF_4 pellets prepared from UO_3 by starch reduction followed by hydrofluorination. Neither dry O_2 nor dry air adequately removed the carbon even at temperatures as high as 600°C, and reaction times of up to 5 hr did not significantly increase the amount of carbon removed over that removed in 1 hr. Combustions carried out much above 400°C resulted in excessive oxidation of the UF_4. Reaction with CO_2 at 750°C did not increase the amount of carbon removed. Calculations showed that CO is the principal carbon-containing product formed from starch in the reduction of UO_3. It was concluded that the bulk of carbon removed was that on the surface of the pellets, having been deposited there when CO converts to CO_2. The remaining carbon was occluded within the pellets and was not easily accessible to a gaseous reactant. (auth)

12418 CF-56-6-155
Oak Ridge National Lab., Tenn.
RECOVERY OF U FROM RECYCLE WASTES. L. R. Higgins. June 29, 1956. Decl. Mar. 19, 1957. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

An ion exchange process for recovery of U and HF from MgF_2 scrap is described. If HF is to be recovered, the MgF_2 is leached with H_2SO_4 and retorted to recover HF. The UO_2SO_4 is extracted on anion exchange resin, complexed with brine or 9M HCl, and the UO_2Cl_2 complex is then eluted with water as UO_2Cl_2. If HF is not to be recovered, the MgF_2 is leached with HCl, the UO_2Cl_2 complex is sorbed directly on the resin and eluted with water. A carbonate leach may also be used. (T.R.H.)

12419 CF-56-6-158
Oak Ridge National Lab., Tenn.
PURIFICATION OF SCRAP URANIUM BY ELECTROLYSIS. L. R. Higgins. June 29, 1956. Decl. Mar. 19, 1957. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80 (mf OTS).

Uranyl fluoride–hydrofluoric acid solution may be electrolytically reduced to hydrated UF_4 with a current efficiency of 90% for a 99% reduction using a Hg electrode. The usual production rate is about 2 a/in^2. or about 2½ lb U/hr-ft^2 of cathode. (L.T.W.)

12420 K-727(Del.)
Carbide and Carbon Chemicals Div. K-25 Plant, Oak Ridge, Tenn.
LIQUID PHASE FLUORINATION OF URANIUM METAL WITH BROMINE TRIFLUORIDE. G. J. Vogel and R. W. Vogel. Mar. 14, 1951. Decl. with deletions Mar. 27, 1957. 21p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

Bromine trifluoride of 95 mole % purity has been prepared by reacting gaseous F_2 with liquid Br at 10°C. with a 95% yield based on Br. The reaction rate of U and purified BrF_3 to produce UF_6 is too slow to be feasible. However, with the addition of HF or Br to the BrF_3 reaction rates were observed up to 2 g. UF_6 produced per hour per square centimeter of original surface area at 50°C. To facilitate the separation of UF_6 from the reaction products the Br was first fluorinated by gaseous F_2. The UF_6 was then separated by distillation in a packed column. (auth)

12421 KAPL-M-MBR-4
Knolls Atomic Power Lab., Schenectady, N. Y.
PROPOSED CHALK RIVER IRRADIATIONS FOR INVESTIGATION OF URANIUM OXIDE. Myron B. Reynolds. Dec. 12, 1951. Decl. Mar. 9, 1957. 24p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

An experimental irradiation program directed at investigating the thermal properties of UO_2 is described. (T.R.H.)

12422 M-3006
Du Pont de Nemours (E. I.) & Co., Jackson Lab., Wilmington, Del.
TENTATIVE DYE WORKS PROCESS FOR THE MANUFACTURE OF C-106 (CRUDE) FROM C-100. C. W. Maynard. May 17, 1943. Decl. Mar. 6, 1957. 6p. $1.80 (ph OTS); $1.80(mf OTS).

The process for the preparation of crude UNH by the dissolution of sodium uranate in dilute HNO_3 is described. Flowsheets, equipment descriptions, and product specifications are included. (C.W.H.)

12423 M-3790
Harshaw Chemical Co., Cleveland.
ANALYSIS OF SPECIAL OXIDE. Mar. 1, 1946. Decl. Mar. 6, 1957. 2p. $1.80(ph OTS); $1.80(mf OTS).

12424 MCW-109
Mallinckrodt Chemical Works, St. Louis.
UF_4 PRODUCTION BY CONTINUOUS METHODS. Progress Report of Pilot Plant [for] the Period of July 9, 1948 to August 14, 1948. E. K. Teter. Aug. 24, 1948. Decl. Mar. 28, 1957. 4p. $1.80(ph OTS); $1.80(mf OTS).

Additional runs were made in the UO_2-hydrofluorinating apparatus to investigate the problem of obtaining non-lumpy green salt (UF_4) product. Temperature variations and retention times are related to lumpiness and degree of conversion. The cast Hastelloy C tube cracked during this period; its replacement with a steel tube is discussed. (D.E.B.)

12425 MCW-118
Mallinckrodt Chemical Works, St. Louis.
EQUILIBRIUM RATIO OF HYDROGEN FLUORIDE AND WATER IN THE FLUORINATION OF URANIUM DIOXIDE AT HIGH TEMPERATURES. Carl W. Kuhlman. July 15, 1948. Decl. Feb. 26, 1957. 7p. $0.25(OTS).

The concentration of HF in HF–H_2O mixtures in equilibrium with mixtures of UO_2 and UF_4 was measured at various temperatures in the range 400 to 700°C. The results show this equilibrium concentration to increase rapidly with the temperature. Equilibrium constants calculated from these data are fitted to the constant pressure form of the Van't Hoff reaction isochore to give the equation $\log k_p = -\Delta H/2.303\ RT + C$, where $\Delta H = -46{,}680$ calories/mole. This value for the heat of reaction is compared with values calculated from thermodynamic data. (L.T.W.)

12426 MIT-1052(Pt. II)
Massachusetts Inst. of Tech., Cambridge. Metallurgical Project.
TECHNICAL PROGRESS REPORT FOR THE PERIOD APRIL THROUGH JUNE 1950. Sept. 8, 1950. Decl. Feb. 26, 1957. 19p. Contract W-7405-eng-175. $3.30 (ph OTS); $2.40(mf OTS).

Preliminary studies indicate that the growth of alpha-extruded U during thermal cycling is progressively reduced as the C content is increased. (auth)

12427 NAA-AL-345
North American Aviation, Inc., Los Angeles.
DISTRIBUTION OF URANIUM IN IMPREGNATED GRAPHITE RODS. M. C. Sanz, R. Randolph, and L. Martin. Dec. 10, 1947. Decl. Feb. 27, 1957. 5p. $0.25 (OTS).

12428 NYO-3793
Metal Hydrides, Inc. Chemical Research Lab., Beverly, Mass.
SECOND QUARTERLY REPORT ON THE REDUCTIONS OF URANIUM OXIDES. Robert W. Bragdon. Jan. 10, 1953. Decl. Mar. 28, 1957. 15p. Contract AT(30-1)-1350. $3.30(ph OTS); $2.40(mf OTS).

The progress on a program designed to evaluate methods of preparing uranium hydride from the various oxides of uranium is presented. The current portion of the investigation is concerned with the reduction of UO_2, UO_3, and U_3O_8 with calcium hydride in an atmosphere of H_2, and three such reductions are described. Chemical analyses of the products indicate that the reductions are incomplete under the specific conditions employed in these three runs. These conditions are the simplest and are not those which can be considered optimum. An apparently satisfactory standard laboratory leach method for the removal of the by-products has been evaluated, using a synthetic furnace product, and this method is currently being employed in the isolation of actual products. The evaluation of these products was seriously hindered by the difficulty in obtaining a sufficiently pure argon atmosphere for the dry box. The passage of tank argon over titanium sponge at 850 to 900°C has effectively solved this problem. (auth)

12429 NYO-3800
Metal Hydrides Inc. Chemical Research Lab., Beverly, Mass.
SECOND ANNUAL REPORT ON THE PREPARATION OF

URANIUM HYDRIDE. Period Covered: July 1, 1953 through June 30, 1954. Sidney Johnson. Aug. 20, 1954. Decl. Feb. 26, 1957. 37p. Contract AT(30-1)-1350. $0.40(OTS).

Uranium metal of density 18.55 g/cm^3, or greater than 97% of the theoretical value, has been prepared by hot-pressing UH_3 powder obtained from the direct reduction of UO_2 with CaH_2, and leaching the resulting furnace product with aqueous acid. Massive metal of better quality could not be produced by the process employed because of the interaction between the UH_3 and the aqueous leaching media. Although the initial reaction rate of UH_3 with methanol is smaller by an order of magnitude than the reaction rate of UH_3 with H_2O, methanolic HCl did not prove to be satisfactory leaching medium. Optimum furnacing conditions for the reduction have been determined. Analytical methods for evaluating UH_3 powders were perfected during the course of the investigation. These methods include: (1) direct determination of O_2 in U and UH_3 by reaction with BrF_3; (2) densities of U pellets produced by a small scale hot-pressing technique from UH_3 powders; and (3) U oxide assays by dissolution of UH_3 in a measured excess of $Ce(HSO_4)_4$ solution. (auth)

12430 NYO-5045
Mallinckrodt Chemical Works, St. Louis.
THE REDUCTION OF ORANGE OXIDE [UO_3] TO BROWN OXIDE [UO_2] BY MEANS OF ARTIFICIAL AND NATURAL GAS. Jan. 6, 1944. Decl. Mar. 28, 1957. 5p. $1.80(ph OTS); $1.80(mf OTS).

It was found that at 800°C, natural and city gas (the latter is a blend of coke-oven and natural gas) will reduce orange oxide to brown and give a product of the desired assay. At temperatures below 700°C, the reduction is slow and is not complete. At 800°C, heavy deposits of carbon formed during this reduction on the metal reaction chamber. The flaking-off of these deposits and the resulting contamination of the brown oxide is sufficient to render the use of gas impractical in the present factory equipment. (auth)

12431 NYO-5046
Mallinckrodt Chemical Works, St. Louis.
THE PREPARATION OF URANOUS SULFATE. Jan. 20, 1944. Decl. Mar. 30, 1957. 10p. $1.80(ph OTS); $1.80 (mf OTS).

12432 NYO-5047
Mallinckrodt Chemical Works, St. Louis.
THE PREPARATION OF URANOUS SULFATE. Report No. II. Mar. 15, 1944. Decl. Mar. 30, 1957. 7p. $1.80(ph OTS); $1.80(mf OTS).

Preparation of $U(SO_4)_2$ is described. If regular UO_2 is used in place of micro-pulverized UO_2, reaction time must be increased from 1 to about 7 days. Characteristics of the product obtained are described. It may be readily analyzed for materials insoluble in H_2O, U, sulfate, and Fe. (T.R.H.)

12433 NYO-5189
Mallinckrodt Chemical Works, St. Louis.
THE LOSS ON IGNITION TEST FOR PURIFIED URANIUM TRIOXIDE. R. W. Bragdon, C. L. French, and G. L. Martin. July 1946. Decl. Mar. 16, 1957. 13p. $3.30(ph OTS); $2.40(mf OTS).

The difficulty experienced in obtaining satisfactory agreement of loss on ignition results between plant batches and finished lots of UO_3 was attributed to the hygroscopicity of the sample. The loss on ignition test for uranium trioxide was investigated, and it was found that the temperature of the ignition (250°C) was too low to drive off all the nitrate and water. A graph of temperature vs. loss on ignition was made, and several other temperature ranges were considered. An ignition at 525°C seemed promising but gave low results. The low results may be caused by failure to bring the samples to constant weight and may in small part be due to residual nitrate content. An ignition at 800°C for twenty minutes, which converts the sample to U_3O_8, was found to be the best method of analysis for loss on ignition of UO_3. A limit of 1.8% loss on ignition (basis of U metal) for the 800°C test is recommended as best correlating with the limit of 0.3% for the previous test at 250°C. (auth)

12434 SEP-110
Sylvania Electric Products, Inc., Bayside, N. Y.
EQUIPMENT AND PROCEDURES FOR HOT-PRESSING URANIUM AND URANIUM HYDRIDE POWDERS. H. M. McCullough and J. L. Zambrow. Apr. 1953. Decl. Mar. 6, 1957. 27p. Contract AT-30-1-Gen-366. $0.35(OTS).

Equipment and procedures are described for hot-pressing uranium and uranium hydride powders. The methods of loading dry boxes, construction of vacuum pots and vacuum systems, and die and punch designs are given in detail. The hot-pressing operations are described, showing die preparation, method of die fill, pressing, heating, ejection, and inspection procedures. (auth)

12435 SEP-171
Sylvania Electric Products, Inc. Atomic Energy Div., Bayside, N. Y.
PRELIMINARY REPORT ON THE PREPARATION AND USE OF NON-PYROPHORIC URANIUM POWDER. R. B. Wagner, A. Bartoszak, and S. Storchheim. Aug. 9, 1954. Decl. Mar. 12, 1957. 18p. Contract AT-30-1-GEN-366. $0.25(OTS).

Preliminary results have shown that the pyrophoric nature of uranium powder can be inhibited by additions of either paraffin wax or paraffin oil. The resultant mixtures can be safely handled in air and can be processed in air into fuel elements of acceptable density and chemical composition. (auth)

12436 TID-10057
[Metal Hydrides, Inc., Beverly, Mass.]
FIRST ANNUAL REPORT ON THE PREPARATION OF URANIUM HYDRIDE. Robert W. Bragdon. [Aug. 15, 1953]. Decl. Mar. 20, 1957. 27p. Contract AT(30-1)-1350. $0.30(OTS).

A continuing evaluation of a laboratory-scale batch process for the preparation of UH_3 powder is described. The reduction of uranium oxides with Ca and/or CaH_2 by a variety of experimental techniques has given UH_3 which analyzes 99.5 to 99.9% pure. The methods employed are capable of 85 to 95% yields, and it is predicted that plant-scale operation will exceed 95% recovery of product. (auth)

12437 WAPD-PMM-197
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
RESUME' OF URANIUM OXIDE DATA—III. Z. M. Shapiro. Sept. 19, 1955. Decl. Mar. 5, 1957. 57p. $13.80(ph OTS); $4.80(mf OTS).

Investigations into preparation and properties of UO_2 powders are summarized. Preparation methods discussed included: H_2 reduction of UO_3, UH_3 methods, and precipitation. Sintering and fabrication of UO_2 were studied along with chemical properties, physical properties, radiation effects, and mechanical properties. Appendices are included on surface area and density measurements on UO_2 powders and microscopy of UO_2 powders. (T.R.H.)

12438 Y-519
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
THE BEHAVIOR OF RUTHENIUM AND PHOSPHORUS IN THE REDUCTION OF URANIUM TETRAFLUORIDE TO METAL. F. L. Daley and D. W. Kuhn. Nov. 16, 1949. Decl. Mar. 6, 1957. 12p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

By the use of Ru tracer, it was shown that in the reduction of UF_4 to U metal, approximately 95% of the Ru initially present in the UF_4 was carried over into the metal. Uranium tetrafluoride containing up to 1.4% P was reduced to U metal. Approximately one-seventh of the P was carried over into the metal. (auth)

12439 Y-536
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
THE PILOT PLANT CONVERSION OF URANYL AMMONIUM PHOSPHATE TO URANIUM TETRAFLUORIDE ON A CONTINUOUS BASIS. H. M. McLeod, Jr., Don Phillips, and John S. Reece. Dec. 16, 1949. Decl. Mar. 6, 1957. 118p. Contract W-7405-eng-26. $0.70(OTS).

The feasibility of preparing UF_4 from UAP on a continuous basis was investigated. Small scale tests were conducted to define the effect of variables on the degree of completion of the three principal over-all reactions involved in the process: calcination of UAP to remove NH_3 and water; reduction of the calcined residue to convert the U^{6+} fraction to U^{4+}; and hydrofluorination of the reduced material to form UF_4 and gaseous byproducts. Pre-pilot studies were carried out on a continuous basis using the conditions found suitable in the small scale work. In these studies deammoniation, reduction, and hydrofluorination runs were made separately in ribbon reactor units which were large enough to process the equivalent of about 450 grams of UF_4 per hour. A pilot plant was constructed to permit integration of the three steps into one continuous unit with UF_4 discharging at a rate of about 450 grams per hour. During the approximately 23 days of initial pilot plant operation, most of the operating difficulties were overcome and satisfactory performance was obtained during the final seven days. It was concluded that the preparation of UF_4 of a suitable grade on a continuous basis was technically feasible. (auth)

WASTE DISPOSAL

12440 MLM-579
Mound Lab., Miamisburg, Ohio.
LIQUID WASTE DISPOSAL RESEARCH REPORT FOR MARCH 5, 1951 TO JUNE 4, 1951. July 9, 1951. Decl. Mar. 9, 1957. 15p. Contract AT-33-1-GEN-53. $3.30 (ph OTS); $2.40(mf OTS).

Decontamination of TBP metal-recovery wastes by FeS precipitation followed by $Fe(OH)_3-Ca_3(PO_4)_2$ precipitation has been studied with respect to pH control, effect of temperature, NaOCl treatment, and effect of presettling agitation on the settling rate. Decontamination by precipitation of a number of mercaptans, CoS, NiS, MnS, CuS, $PbCrO_4$, $Fe(OH)_3$, BaC_2O_4, and Ni dimethylglyoxime at various stages of the process has been investigated. A cost estimate of the precipitation process compared favorably with costs of evaporation. (C.W.H.)

12441 MLM-672
Mound Lab., Miamisburg, Ohio.
REACTOR WASTE PROCESSING COST ANALYSIS. Information Report. M. McEwen. Mar. 5, 1952. Decl. Mar. 9, 1957. 15p. Contract AT-33-1-GEN-53. $0.25(OTS).

Results are reported from a study of comparative costs of evaporation vs. coprecipitation methods (FeS process) for the concentration of liquid reactor wastes prior to burial. The costs shown for plant-scale operation of the coprecipitation method are based on laboratory studies. Data indicate the FeS process competes economically with evaporation when the percent of dissolved solids in the feed reaches the 1 to 3% value, and the economic advantage of the coprecipitation method becomes very pronounced in processing high-solid-content wastes. (L.T.W.)

ENGINEERING

12442 K-866
Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.
SHAFT SEAL DEVELOPMENT. PART TWO. "A" SERIES PACKED SEAL MANUAL. L. M. Delionback and W. T. Carey. Feb. 25, 1952. Decl. Feb. 23, 1957. 56p. Contract W-7405-eng-26. $10.80(ph OTS); $3.90(mf OTs).

A manual is given describing the fabrication, installation, and maintenance of packed seals in 7HXB Special Sutorbilt Gas Blowers to be used in the C-410 Feed Plant at Paducah. A summary is also included of the work leading to the development of the seal and suggestions for altering the packing, fabrication, and seal design to better adapt them to the actual process operating conditions. (L.T.W.)

HEAT TRANSFER AND FLUID FLOW

12443 CU-11-53-At-dP-Ch.E.(Rev.)
Columbia Univ., New York.
REVIEW OF UNDERWATER BURNOUTS OF 2S ALUMINUM ELECTRICALLY OVERHEATED. A. J. Bendler. May 15, 1953. Decl. Mar. 18, 1957. 14p. [For] Du Pont [De Nemours (E. I.) & Co., Savannah River Lab.]. Contract AT(07-2)-1, Subcontract AX-294. $0.30(OTS).

Underwater arcing and melting failures of electrically overheated 2S aluminum, which have occurred during tests at Columbia University, are discussed with reference to phenomena accompanying the failures, in search of evidence indicating the chemical reactivity between high temperature aluminum and water. Discussion of the evidence, which includes macro- and micro-graphs, leads to the conclusion that even at temperatures as high as the melting and arcing points and in the presence of liquid water or steam, aluminum does not react readily with water. (auth)

12444 NDA-6
Nuclear Development Associates, Inc., White Plains, N. Y.
BOILING BURNOUT NEWSLETTER NO. 4. (Classified Section) (15J-4). John E. Viscardi. May 15, 1955. Decl. Mar. 2, 1957. 9p. Contract AT(30-1)-862. $1.80(ph OTS); $1.80(mf OTS).

Six Al–U samples (Al–U core clad on one side with Al) in contact with H_2O and contained in pressure capsules were exposed in the MTR core for 8 to 12 sec. Three of the samples melted at the face in contact with H_2O. Capsule pressure changes occurred only when melting took place. Two of the 3 melting situations produced pressure transients and temperatures rises that are discussed in some detail. A series of nucleate biling burnout tests in the MTR is proposed in order to establish whether significant differences exist between electrical and in-pile burnout data. A study of length-to-diameter ratio on the burnout heat flux of rectangular, vertical, Zircaloy-2 channels is reported. (T.R.H.)

12445 NDA-8
Nuclear Development Associates, Inc., White Plains, N. Y.
BOILING BURNOUT PROGRESS. ISSUE NO. 5. (Classified Section). (15J-6) John E. Viscardi, ed. June 30, 1955. Decl. Mar. 1, 1957. 8p. Contract AT(30-1)-862. Formerly issued as Boiling Burnout Newsletter. $1.80(ph OTS); $1.80(mf OTS).

Preliminary burnout data were obtained for machined and hot-rolled rectangular Zircaloy-2 channels inclined at an angle of 45°. The test was performed to determine the effect of inclining the channels on burnout heat flux. The data are presented in tabular form. (M.P.G.)

12446 WAPD-S5W-C-288
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
ENGINEERING REPORT OF S5W CONDENSATE POT. CALCULATIONS AND RESULTS. (Standard Bailey Meter Company Condensing Pot Part No. 49693). Gene H. Hasley. Dec. 26, 1956. 12p. Contract AT-11-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

MATERIALS TESTING

12447 KAPL-M-RCD-11
Knolls Atomic Power Lab., Schenectady, N. Y.
HOT PRESSURE TEST ON MARK A POISON TUBE HEADER. William R. Plant. July 28, 1953. 13p. $3.30 (ph OTS); $2.40(mf OTS).

12448 SEP-170(Del.)
Sylvania Electric Products Inc. Atomic Energy Div., Bayside, N. Y.
DETERMINATION OF BONDING OF THIN CLAD COMPOSITES BY ULTRASONIC TECHNIQUES. H. I. Raiklen and R. V. Rubino. July 19, 1954. Decl. with deletions Feb. 28, 1957. 21p. Contract AT-30-1-GEN-366. (DCF-5002(Del.)). $4.80(ph OTS); $2.70(mf OTS).

An ultrasonic method was devised to determine whether the thin Al clad of the flat fuel element was bonded to the U core. (T.R.H.)

PUMPS

12449 KAPL-M-EDL-73
Knolls Atomic Power Lab., Schenectady, N. Y.
HYDRAULIC CHARACTERISTICS OF THREE MODELS OF WATER-COOLANT PASSAGES FOR THE 75 PSI EM PUMP. D. J. Eldredge. June 15, 1954. 23p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

12450 KAPL-M-EDL-98
Knolls Atomic Power Lab., Schenectady, N. Y.
EM PUMP PRESSURE DROP TESTS 85 PSI–$\frac{3}{8}$ SCALE MODEL. MARK B. R. J. Hoe and J. J. Stewart. July 1, 1955. 33p. Contract [W-31-109-Eng-52]. $6.30(ph OTS); $3.00(mf OTS).

The pressure drop vs. flow characteristics of a $\frac{3}{8}$-scale model of a Mark B 85 psi electromagnetic pump are given. (T.R.H.)

12451 KAPL-M-GDC-5
Knolls Atomic Power Lab., Schenectady, N. Y.
CAVITATION IN THE 37-PSI PUMP. G. D. Collins. Aug. 13, 1952. Decl. Mar. 14, 1957. 4p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

RADIOGRAPHY

12452 KAPL-M-DGC-24
Knolls Atomic Power Lab., Schenectady, N. Y.
RADIOGRAPHY PROCEDURE FOR SHIELD MATERIAL ACCEPTANCE TEST. [nd.] 25p. Contract [W-31-109-eng-52]. (KAPL-Spec.-0-KPMO-31 (Rev. 1)). $4.80(ph OTS); $2.70(mf OTS).

The radiographic details of the Shield Material Acceptance Test Procedure for Off-Hull Service Equipment are described. Radiographic detection of shield voids is based on the use of a 20 C Co^{60} source with a detection probe containing 5 Anton Tubes No. 106-C. Permissible variation in counting rates vs. void volume is presented as a function of probe area, tube sensitivity, and shield thickness. Count rate variation of a factor of 2 is no longer applicable but must conform with above permissible scaling factor. (auth)

WASTE DISPOSAL

12453 BNL-1091(Del.)
Waste Processing Committee, AEC.
STATUS OF RADIOACTIVE WASTE PROCESSING AND ACCUMULATION IN PRESENTLY OPERATING AEC RESEARCH AND PRODUCTION SITES. B. Manowitz and W. A. Rodger. Apr. 5, 1951. Decl. with deletions Feb. 12, 1957. 16p. $4.80(ph OTS); $2.70(mf OTS).

A quantitative picture of the over-all waste disposal problems at the presently operating major AEC sites is presented. Data are given on volumes and radioactive concentrations of the wastes handled and effluents discharged, available tankage and process flow sheets. (auth)

12454 LA-1691
Los Alamos Scientific Lab., N. Mex.
INCINERATOR FOR RADIOACTIVE RESIDUE. W. D. McNeese, W. J. Maraman, and T. E. Chronister. Mar. 1954. Decl. Apr. 1, 1957. 21p. Contract W-7405-eng-36. $0.25(OTS).

A batch-type incinerator has been built which will dry and burn 12 liters of wet, packed rags or the equivalent in other organic matter in 8 hr. The material is ignited and burned in a stream of O_2. Tars in the off-gas are trapped in a water bubbler, residual contaminated particles are caught by a CWS filter, and acid vapors are reacted in a caustic scrubber. The unit was designed to process Pu residues; however, other radioactive materials could be handled by the use of appropriate shielding and manipulators. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

12455 LA-1564
Los Alamos Scientific Lab., N. Mex.
A BALL HOLDER FOR COATING OPERATIONS. James R. Lilienthal. Apr. 8, 1953. Decl. Apr. 1, 1957. 12p. Contract W-7405-eng-36. $3.30(ph OTS); $2.40(mf OTS).

A device is described which will support small spheres and cylinders in a vacuum system during a plating operation. While supporting the object to be plated, the device automatically shifts the position of the supports so that the coating is evenly distributed. The mechanism by which this motion is achieved is described. (auth)

12456 ORNL-2078(Del.)
Oak Ridge National Lab., Tenn.
METALLURGY DIVISION SEMIANNUAL PROGRESS REPORT FOR PERIOD ENDING OCTOBER 10, 1955. June 14, 1956. Decl. Apr. 26, 1957. 101p. Contract W-7405-eng-26. $0.65(OTS).

Development of eddy-current testing methods for tubing of low-conductivity alloy continued. Oxidation studies of Nb and Na are reported along with research in self-decomposition, mass transfer, and corrosion in fused hydroxides. In fundamental physico-metallurgical research, work was done on preferred orientation in U-rod, hardness of Sb–Zr, zone-refining of Zr, and Ag–Zr phase studies. Metallurgical research in connection with the HRP included Zr alloy development, stainless steel welding, stainless steel corrosion, and the effect of H_2 on Zr alloys. Studies reported in applied metallurgy included the fabrication and testing of Geneva Conference Reactor fuel elements, and extrusion of Th. A study of uranium oxides and the preparation of large particles of UO_2 is presented, and further ceramic research is reported in the application of gas-ceramic mixtures in nuclear power generation, and waste disposal in ceramics and clays. (T.R.H.)

CERAMICS AND REFRACTORIES

12457 TID-10044
Battelle Memorial Inst., Columbus, Ohio.
SILICON CARBIDE AS THE BASIS MATERIAL FOR PLATE-TYPE FUEL ELEMENTS. L. J. Balint, J. R. Gambino, W. G. Mixer, J. M. Shinn, H. E. Wagner, and W. H. Duckworth. Sept. 1, 1953. Decl. Mar. 18, 1957. 37p. Contract W-7405-eng-92. $0.35(OTS).

The work in development of UO_2–SiC ceramic bodies for cores of plate-type fuel elements is described. Bodies were prepared using MgO, Al_2O_3, Al, and Si as bonding materials and were sintered in various atmospheres. None of the ceramic bodies produced met the requirements set up for these fuel elements. (T.R.H.)

CORROSION

12458 ANL-5376
Argonne National Lab., Lemont, Ill.
PRELIMINARY REPORT ON CORROSION OF URANIUM–BASE ALLOYS CONTAINING NIOBIUM AND ZIRCONIUM. Austin E. Dwight and A. H. Roebuck. Dec. 19, 1954. Decl. Apr. 4, 1957. 21p. Contract W-31-109-eng-38. $0.35 (OTS)

Tests were made to determine the effects of composition and heat treatment on the corrosion resistance and hardness of samples of arc-melted, unclad U-Nb-Zr alloys exposed to static, degassed water at 400F. Samples of eleven compositions were tested; eight different heat treatments were utilized. Specimens quenched from the gamma and beta ranges exhibited varying degrees of corrosion resistance, while alpha-annealed or furnace-cooled specimens disintegrated after testing for 168 hr. In general, the specimens having a Rockwell C hardness of <20 exhibited the best corrosion resistance. For alloys comparable to those used in this investigation (640 to 785 ppm C; 38 to 58 ppm N), the ternary compositions ranging from approximately 2 to 4 wt.% Zr, and from 3 to 5% Nb, balance U, are the most promising for further investigation. (auth)

12459 BMI-268(Del.)
Battelle Memorial Inst., Columbus, Ohio.
CORROSION-RESISTANT MATERIALS FOR HYDROFLUORIC ACID. H. A. Pray, F. W. Fink, B. E. Friedl, and W. J. Braun. June 15, 1953. Decl. with deletions Feb. 13, 1957. 62p. Contract AT(30-1)-gen-228. $10.80(ph OTS); $3.90(mf OTS).

In the production of UF_4 from uranium raw materials and in certain associated plant operations, severe corrosion problems involving hydrofluoric acid have been encountered. A series of metals, as well as a selection of plastics, has been subjected to hydrofluoric acid solutions at the boiling point and at 140°F. A few metals have also been tested in anhydrous hydrogen fluoride at 50°F. Corrosion results are presented for boiling 38 and 48% acid; for 50, 65, and 70% acid at 140°F; and for anhydrous HF plus a trace of water at 50°F. The acid studies include experiments with metals in the vapor, at the interface, as well as completely immersed in the solution. Particular attention has been devoted to the effects of O_2 in the system. Data are given also to show the effect of galvanic couples, including couples with graphite. Alloys of Cu, particularly those containing Ag, Ni, and/or P, have been investigated with regard to the behavior in HF. Iron at two C and two si levels has been evaluated in 70% Fe. Contaminants, such as sulfate and Fe, have been added to the acid to study the effects on the corrosivity of the medium. (auth)

12460 CF-56-1-54
Oak Ridge National Lab., Tenn.
HRP DYNAMIC CORROSION STUDIES. Summary of Run L-33. J. C. Griess, R. S. Greeley, and S. R. Buxton. Jan. 11, 1956. Decl. Mar. 13, 1957. 10p. Contract [W-7405-eng-26.] $1.80(ph OTS); $1.80(mf OTS).

The corrosive effects of UO_2SO_4–$CuSO_4$–H_2SO_4 solution on Zr, Zircaloy, Ti, and stainless steel at 200°C after 1139 hrs are reported. (D.E.B.)

12461 CF-56-1-155
Oak Ridge National Lab., Tenn.
HRP DYNAMIC CORROSION STUDIES. Summary of Run I-30. J. C. Griess, R. S. Greeley, and S. R. Buxton. Jan. 10, 1956. Decl. Mar. 13, 1957. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The results of a 2966 hr, 150°C corrosion test of stainless steel, Ti, and Zircaloy in $CuSO_4$–H_2SO_4–UO_2SO_4 are reported. (D.E.B.)

12462 CF-56-2-2
Oak Ridge National Lab., Tenn.
EFFECTS OF ELECTRON IRRADIATION ON THE CORROSION OF ZIRCALOY-2 IN A THERMAL LOOP. B. O. Heston and M. D. Silverman. Feb. 2, 1956. Decl. Mar. 16, 1957. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

12463 CF-56-2-140
Oak Ridge National Lab., Tenn.
SUMMARY OF TOROID RUN NO. 84. TYPE 347 STAINLESS STEEL, TITANIUM 75A AND ZIRCALOY-2 IN URANYL SULFATE AT 250°C AND 25 fps. THE EFFECT IN LITHIUM SULFATE. G. E. Moore. Feb. 24, 1956. Decl. Mar. 16, 1957. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

12464 CF-56-6-120
Oak Ridge National Lab., Tenn.
DEVELOPMENT OF THE LITHIUM URANIUM CARBONATE SYSTEM FOR USE IN HOMOGENEOUS REACTORS. H. F. McDuffie. June 21, 1956. Decl. Mar. 19, 1957. 5p. Contract [W-7405-eng-26.] $1.80(ph OTS); $1.80(mf OTS).

12465 CF-56-7-52
Oak Ridge National Lab., Tenn.
HRP DYNAMIC SOLUTION CORROSION STUDIES [FOR] QUARTER ENDING July 31, 1956. J. C. Griess, H. C. Savage, J. L. English, R. S. Greeley, S. R. Buxton, R. M. Warner, and R. M. Pierce. July 31, 1956. Decl. Mar. 13, 1957. 50p. Contract [W-7405-eng-26.] $7.80 (ph OTS); $3.30(mf OTS).

A laboratory-scale corrosion study has shown the susceptibility of stainless steel to stress-corrosion cracking in boiling simulated HRT fuel solutions containing chloride

ions. During a 500-hr test period stressed specimens showed cracking at chloride concentrations of 25 and 50 ppm; no cracks were apparent at the 5, 10, and 100 ppm levels. At the two lower chloride concentrations no acceleration of corrosion was noted. At all other concentrations generalized corrosion was appreciable, being the highest at the 100 ppm level. Very preliminary tests with the simulated HRT solution containing 100 ppm Br or I have shown no cracking of the specimens, although generalized attack was increased by the presence of the Br. One phase of a test program to examine the corrosion-fatigue behavior of type 347 stainless steel bellows in UO_2SO_4 solutions at elevated temperatures has been completed. The results indicate that the life of the bellows is not greatly shortened when a UO_2SO_4 solution is used as the corrodant instead of distilled water. The corrosion of Al_2O_3 in 0.04 to 0.17 m UO_2SO_4 containing $CuSO_4$ and H_2SO_4 at 150°C has been studied in toroid runs. Corrosion rates between 1 and 3 mpy were observed. (auth)

12466 ESP-52-351

Du Pont de Nemours (E. I.) & Co. Experimental Station, Wilmington, Del.

CORROSION OF STEEL BY HYDROGEN SULFIDE. Progress Report [for] Period September, 15–December 11, 1952. J. C. Rowell. Jan. 8, 1953. Decl. Mar. 20, 1957. 17p. $3.30(ph OTS); $2.40(mf OTS).

The role of the iron sulfide scale in H_2S corrosion of steel is investigated. The structure, characteristics, and mechanism of formation of the iron sulfide are given. (T.R.H.)

12467 KAPL-M-EGB-19

Knolls Atomic Power Lab., Schenectady, N. Y.

CARBURIZATION OF STAINLESS STEEL IN SODIUM. Report No. I. Preliminary Analysis. E. G. Brush. July 14, 1955. 41p. Contract W-31-109-Eng-52. $7.80 (ph OTS); $3.30(mf OTS).

It is concluded that type 347 stainless steel is subject to grain boundary carburization in Na contaminated with carbon. Equations for calculating the carburization depth are given. (T.R.H.)

METALS AND METALLURGY

12468 A-4048

Ames Lab., Ames, Iowa.

DEVELOPMENTS IN CUTTING AND MACHINING URANIUM AT THE IOWA STATE COLLEGE LABORATORY. C. F. Gray. Jan. 1946. Decl. Feb. 13, 1957. 31p. $6.30 (ph OTS); $3.00(mf OTS).

12469 ANL-5078

Argonne National Lab., Lemont, Ill.

PRELIMINARY REPORT ON LOW COLUMBIUM: URANIUM CORROSION RESISTANT ALLOYS. J. E. Draley. June 24, 1953. Decl. Apr. 2, 1957. 9p. Contract W-31-109-eng-38. $1.80(ph OTS); $1.80(mf OTS).

Uranium alloys containing 3 and 6 wt. % Nb and 1.5% nb–1.2% Zr have been prepared in which the impurity content is low. These alloys show very promising resistance to corrosion by H_2O at 260 and 300°C. The corrosion resistance is exhibited in degassed H_2O and in H_2O which is saturated with air or O_2 at room temperature before testing. (auth)

12470 ANL-5299

Argonne National Lab., Lemont, Ill.

THE FABRICATION OF URANIUM CLAD FUEL ELEMENTS FOR THE FAST EXPONENTIAL EXPERIMENT. R. A. Noland and C. C. Stone. Oct. 1954. Decl. Feb. 26, 1957. 41p. Contract W-31-109-Eng-38. $0.40(OTS).

This report describes the development of methods to fabricate natural uranium-clad, flat-plate fuel elements to be used in the Fast Exponential Experiment being conducted by the Argonne National Laboratory. The fuel elements were mechanically enriched to 25 wt.% U^{235} by arranging natural uranium plates in a picture frame around a fully enriched core and subsequently arc welding. The method is described in detail. The degree of control of operating ranges of the welding variables was approximately the same as required in welding commercial metals. Considerably more care was necessary, however, in gas-shielding the work to prevent oxidation, and the weld metal required external support. In all, 282 of the 480 plates fabricated were examined for leaks. Less than one per cent contained leaks in the edge weld, and all were repairable. A considerable number of units were found with small leaks due to cracks and inclusions in the plate stock. These assemblies were considered fit for use after conducting simulated service tests upon a small number of representative samples. (auth)

12471 BMI-923

Battelle Memorial Inst., Columbus, Ohio.

SOLDER BONDING ALUMINUM TO URANIUM. H. W. Mishler, J. T. Niemann, R. P. Sopher, and D. C. Martin. July 7, 1954. Decl. Feb. 26, 1957. 28p. Contract W-7405-eng-92. $0.35(OTS).

This study was undertaken to determine if flat-plate fuel elements could be produced by solder bonding Al sheets to a U core. It was necessary to plate the U with Cr, Fe, or Ni, which served as a diffusion barrier. The solders used were Pb, Sn, Zn, and their alloys. No provision was made for removing surface oxides on the base metals. Therefore, it was necessary to plate the Al and the U diffusion barrier. The best bonds were produced with Al plated with 0.5 mil of Cu and Ni-plated U given a Cu flash. Corrosion tests on bonded samples showed Zn was the most corrosion-resistant solder tested. Successive samples made with like solders sometimes varied in joint quality. A greater variation would probably exist in larger samples made under mass-production conditions. (auth)

12472 BMI-1061

Battelle Memorial Inst., Columbus, Ohio.

DEVELOPMENT OF METHODS FOR END CAPPING PWR FUEL ELEMENTS. Julius J. Vagi and David C. Martin. Dec. 28, 1955. Decl. Apr. 2, 1957. 46p. Contract W-7405-eng-92. $7.80(ph OTS); $3.30(mf OTS).

Exploratory tests performed during the first phase of this investigation indicated that the U–12 wt. % Mo cored fuel rod for PWR might be end capped by resistance-upset welding. Studies of welding methods were continued to develop procedures which would improve the integrity of resistance-upset-welded end-closure bonds. A medium-capacity spot-welding machine was utilized for resistance-upset welding recessed joints under vacuum; glass-lined steel backups were used to prevent fuel upset. Visual examination of fractured joints and metallographic examinations of sections indicated that fuel rod-to-cap bonds were good. Corrosion testing, chemical analyses, and detailed metallographic examinations were used in further evaluation of the clad-to-cap bond to determine the consistency in quality of a large number of samples. Attempts to relate failures in corrosion tests with defects indicated by nondestructive tests generally were not successful. Only in cases of gross defects that were indicated by radiographs was any correlation made. A brief study of flash welding was made to determine if it could be used to obtain good clad-to-cap bonds. The results obtained did not justify extensive development. A few arc-welding tests were

made to determine if fusion welds could be used to seal the resistance butt welds. (auth)

12473 BMI-1094(Del.)
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING MAY 1956. Russell W. Dayton and Clyde R. Tipton, Jr. June 1, 1956. Decl. with deletions Feb. 13, 1957. 86p. Contract W-7405-Eng-92. $13.80(ph OTS); $4.80(mf OTS).

Studies were continued on the following: elevated-temperature properties of Al–U alloys; phase equilibria in Th–U alloys; radiation damage to graphite; extrusion cladding of flat fuel plates; metallographic evaluation of dingot–U tubes; preparation and reduction of UO_3; electric properties of UO_2; corrosion of stainless steel alloys by plant liquors; development of graphite, BeO, and $MoSi_2$ as fuel-element matrix material; high-temperature properties of Mo–U alloys; uranium corrosion; phase studies, heat treatment, and corrosion of U–Zr alloys; corrosion of Zr-base alloys by H_2O and steam; heat treatment of Zr alloys; Zr–UO_2 reactions at high temperatures; coating of stainless steel with Mo; preparation and properties of U compounds; oxidation of Nb and Nb alloys; water–zircaloy reactions; and thermal fracture and corrosion resistance of UO_2–ceramic systems. (C.W.H.)

12474 CF-52-8-148(Chap. 11(Del.))
Oak Ridge School of Reactor Technology, Tenn.
REACTOR MATERIALS. CHAPTER 11. BERYLLIUM. George E. Evans. Apr. 23, 1953. Decl. with deletions Feb. 14, 1957. 34p. $6.30(ph OTS); $3.00(mf OTS).

The production, fabrication techniques, physical and mechanical properties, radiation effects, and corrosion of Be are summarized. (M.H.R.)

12475 CF-56-5-141
Oak Ridge National Lab., Tenn.
METALLOGRAPHIC EXAMINATION OF GLASSED TITANIUM SPECIMENS. M. L. Picklesimer. May 18, 1956. 7p. Contract [W-7405-Eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Two glassed Ti specimens were examined metallographically for damage to the metal. Both specimens, of A-55 Ti were coated with a glass frit and fired at 1610°F. One specimen, called "short fire" was fired for 8 minutes, the other specimen, called "long fire" was fired for 16 minutes. (W.L.H.)

12476 HW-32801
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
ALUMINUM CAN QUALITY. R. S. Dalrymple. Aug. 19, 1954. Decl. Apr. 4, 1957. 10p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The use of caustic etching techniques as a means of comparing the metallurgical quality of slug cans was evaluated. While this etching appears to provide a relatively rapid and inexpensive method of determining the degree of segregation of constituents in can stock, it appears to be of little value for evaluation of the seriousness of slug jacket defects. (W.L.H.)

12477 KAPL-1525
Knolls Atomic Power Lab., Schenectady, N. Y.
FABRICATION OF URANIUM-RICH URANIUM–MAGNESIUM DISPERSION FUELS BY POWDER HOT PRESSING. R. N. Honeyman. Apr. 26, 1956. Decl. Apr. 11, 1957. 21p. Contract W-31-109-eng-52. $0.30(OTS).

A dispersion-type fuel element of U in a Mg matrix irradiated in the MTR previously has been shown to sustain exceptionally high burnup compared to the solid U fuel slugs now used. This report describes the development of a hot-pressing, powder metallurgy process for consolidating these materials into fully dense compacts with spherical U particles, uniformly dispersed throughout the Mg matrix. (auth)

12478 LA-1202
Los Alamos Scientific Lab., N. Mex.
IMPACT EXTRUSION OF URANIUM. G. S. Hanks, G. E. Jaynes, J. M. Taub, D. T. Doll, R. Osborn, G. Sweeney, and V. Vigil. Jan. 10, 1951. Decl. Mar. 26, 1957. 51p. Contract W-7405-eng-36. $7.80(ph OTS); $3.30(mf OTS).

U has been successfully impact extruded into typical cylindrical shapes of conventional design. Extrusion was carried out in the γ region by heating cast U slugs to a temperature of approximately 1050°C. Protection against oxidation was afforded by surrounding the slugs during heating with an inert atmosphere of Ar gas. (auth)

12479 LA-1405(Del.)
Los Alamos Scientific Lab., N. Mex.
PREPARATION OF URANIUM–MOLYBDENUM ALLOYS BY BOMB REDUCTION. B. R. Hayward. Feb. 1952. Decl. with deletions Mar. 7, 1957. 19p. Contract W-7405-eng-36. $3.30(ph OTS); $2.40(mf OTS).

High purity, homogeneous U-Mo alloys have been made successfully in the reduction bomb. The preparation of the alloys and some of their properties are described. (auth)

12480 LA-1605
Los Alamos Scientific Lab., N. Mex.
EFFECT OF ANNEALING PRACTICE OF THE HYDROGEN CONTENT OF URANIUM. James T. Waber. Nov. 1953. Decl. Apr. 1, 1957. 16p. Contract W-7405-eng-36. $0.25 (OTS).

It was found that H_2 is introduced into U during process annealing in a fused salt bath. The increased H_2 content reduces the tensile elongation and general formability of the metal. The partial removal could be effected by annealing in A, He, or N, and better by annealing in high vacuum at temperatures above 450°C. The effect of the H_2 content on the tensile properties was confirmed by annealing in H_2. Tensile properties, the H_2 content, and certain x-ray results after each annealing treatment are presented and briefly discussed. (auth)

12481 LA-1619
Los Alamos Scientific Lab., N. Mex.
EFFECT OF ANNEALING MEDIA ON THE MECHANICAL PROPERTIES OF URANIUM. G. S. Hanks, J. M. Taub, D. T. Doll, T. I. Jones, and V. Vigil. Aug. 1, 1953. Decl. Mar. 26, 1957. 84p. Contract W-7405-eng-36. $13.80 (ph OTS); $4.80(mf OTS).

The annealing or heat treatment of U in any medium other than a good vacuum or purified helium atmosphere will lower the room-temperature properties of ultimate strength, hardness, and elongation. In general, the elongation of vacuum annealed uranium exceeds considerably the elongation of air or salt annealed U. Any annealing medium which permits contact of the U metal with atmospheric gases tends to produce low elongation and ductility and a lowering of the ultimate strength. The above is true for U in any solid form, whether it is rolled sheet, cast bars or plates, rolled rod, or extruded shapes. Annealing in the molten-salt bath (65% potassium carbonate and 35% lithium carbonate), which is used by Los Alamos and other Laboratories concerned with the fabrication of U, produces the lowest elongation or ductility and ultimate strength when compared to similar properties of metal annealed in the other media examined. Mass spectrometer analyses of the dissolved gases present in high ductility and low ductility uranium indicate that dissolved hydrogen is prob-

ably the chief cause of low physical properties. It is possible to cycle uranium between salt annealing and vacuum annealing with the resulting cycling of low elongation for the salt annealing and high elongation for the vacuum annealing. Metallographic examination and ordinary spectrochemical analysis show no difference between the low ductility U and the high ductility U. Regardless of the previous heat treatment or annealing history of a piece of U, a vacuum anneal for approximately 24 hours at 350 to 400°C will restore the maximum ductility and ultimate strength. The ductility and other physical properties approach the same figure at temperatures of 200°C or above regardless of previous heat treatment history It is recommended that for any component or other part made of U, where either the maximum physical properties are desired or where uniformity of physical properties throughout the part is desired, the U be given a vacuum anneal for at least 24 hours at a temperature of 350 to 400°C before fabrication, or if not practical to vacuum anneal before fabrication of the part, vacuum anneal the finished piece. (auth)

12482 LRL-135(Rev.)
California Research and Development Co. Livermore Research Lab., Livermore, Calif.
FEASIBILITY OF FABRICATING URANIUM SPHERES BY POWDER METALLURGICAL TECHNIQUES. C. H. Bean and H. T. Campion. May 1954. Decl. Mar. 12, 1957. 15p. $0.30(OTS).

A system of fabricating ½-inch-diameter uranium spheres by powder metallurgy techniques was developed. Initial tests indicate that spheres produced by this method will exceed 95% of theoretical density and will possess good dimensional tolerances. (auth)

12483 LWS-24923
California Research and Development Co., Livermore, Calif.
A DISCUSSION OF THE CONTROLLING RATES OF VACUUM DISTILLATION OF METALS. J. E. Vivian. Sept. 24, 1953. Decl. Mar. 29, 1957. 6p. (CRD-R-92). $1.80(ph OTS); $1.80(mf OTS).

The relative rates of evaporation from liquid metal surfaces and diffusion to the surface in the liquid phase are compared and their effect on the separation of metal mixtures by vacuum distillation is discussed. It is concluded that under some conditions liquid phase diffusion may be significant, and that the relative rates will vary with temperature. (auth)

12484 M-2190
[Clinton Labs., Oak Ridge, Tenn.]
HEAT TREATMENT AND MATERIAL SPECIFICATIONS FOR WROUGHT 18-8-S-Cb AND 25-12-S-Cb. N. R. Glarum. Feb. 27, 1945. Decl. Mar. 6, 1957. 21p. $4.80 (ph OTS); $2.70(mf OTS).

Corrosion data for Nb steels in chlorides, fluorides, ceric solutions, dichromates, SO_2, and HNO_3 are reported. Material specifications of the steels are included. (C.W.H.)

12485 M-3576
Battelle Memorial Inst., Columbus, Ohio.
BRAZING ALUMINUM-ALLOY REACTORS. L. H. Grenell and R. C. Dawes. Mar. 25, 1947. Decl. Mar. 7, 1957. 18p. Contract W-7405-eng-92. (BMI-HWR-S-C-11). $3.30(ph OTS); $2.40(mf OTS).

A self-supporting assembly for brazing Al–Si reactor units was investigated. Brazing was carried out in a circulating-atmosphere furnace maintained at 625°C and using commercial Al brazing sheet. (C.W.H.)

12486 M-3992
Clinton Labs., Oak Ridge, Tenn.
METALLURGY OF URANIUM, THORIUM, AND BERYLLIUM. Pile Technology Lectures 7, 8, and 9. F. Foote and E. J. Boyle. [1947]. Decl. Mar. 6, 1957. 14p. Contract W-7405-eng-39]. $3.30(ph OTS); $2.40(mf OTS).

The preparation, melting and casting, fabrication, phase studies, and alloying of uranium, thorium, and beryllium are reviewed. (C.W.H.)

12487 NAA-SR-1680
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
THE VOLATILIZATION OF FISSION PRODUCTS FROM MOLTEN AND SOLID THORIUM–URANIUM ALLOY. T. A. Milne and C. T. Young. Dec. 15, 1956. Decl. Mar. 14, 1957. 19p. Contract AT-11-1-GEN-8. $0.30(OTS).

The volatilization of fission products from molten and solid irradiated Th-(3 wt. %) U has been investigated. The effects of temperature, time, and area-to-weight ratio have been studied. Ninety-five per cent or more of the Cs, Sr, and Te were volatilized from solid or liquid Th with ease. Cerium and other rare earths were more difficult to remove but might be volatilized from liquid or solid Th by employing a sufficient time or large surface areas. It does not appear feasible to remove U from Th by volatilization. (auth)

12488 NLCO-624
National Lead Co. of Ohio, Cincinnati.
THE FABRICATION OF ARC-MELTED THORIUM METAL. J. A. Stanley, T. C. Runion, and F. L. Cuthbert. Apr. 9, 1956. Decl. Mar. 4, 1957. 8p. Contract AT(30-1)-1156. $0.30(OTS).

The production of large tonnages of thorium metal of various sizes and shapes by conventional fabrication methods (e.g., hot extrusion, hot or cold rolling, forging, cold swaging, and machining) indicates that good forming qualities are an inherent property of the metal processed by National Lead Company of Ohio. (auth)

12489 NMI-1118
Nuclear Metals, Inc., Cambridge, Mass.
USE OF A DENSITY (SPECIFIC VOLUME) METHOD AS A SENSITIVE ABSOLUTE MEASURE OF ALLOY COMPOSITION, AND ITS APPLICATION TO THE ALUMINUM–URANIUM SYSTEM. L. R. Aronin and J. L. Klein. Oct. 29, 1954. Decl. Mar. 8, 1957. 44p. Contract AT(30-1)-1565. $0.40(OTS).

Mass density measurement (or its reciprocal, specific volume) is shown to be a highly sensitive and accurate method for calculating composition in the Al–U system. Theoretical considerations of application of density measurement to composition calculation are given for the general case of a simple binary alloy, and specific applications to the Al–U system are considered in detail for a structure consisting of primary Al and UAl_4 compound. Extraneous factors which could influence a density-composition correlation are considered analytically. These factors—voids, variations in composition and density of primary aluminum and UAl_4 compound, presence of UAl_3 as a non-equilibrium phase, and presence of a foreign phase such as uranium carbide—are shown to lead to negligible error under the experimental conditions of this work. Experimental application of the hydrostatic weighing method to obtain density values reproducible to one part in 10,000 is described. In the composition range investigated experimentally, 7 to 21 wt. % U, this reproducibility corresponds to an uncertainty of ±0.03 wt. % U. Good experimental correlation is obtained between

compositions calculated from density measurements and those measured by conventional chemical analysis. (auth)

12490 NMI-1139
Nuclear Metals, Inc., Cambridge, Mass.
TECHNICAL PROGRESS REPORT FOR THE PERIOD APRIL–SEPTEMBER 1955. Feb. 8, 1956. Decl. Feb. 28, 1957. 202p. Contract AT(30-1)-1563. $1.10(OTS).

Techniques for improving the perfection of Be single crystals have been studied. It appears that directional remelting of an imperfect crystal does improve its quality but that high temperature annealing in the solid state effects little improvement. The high temperature strength of Be may be substantially improved by dispersed inclusions introduced to Be powders. Colloidal carbon, which presumably converts to Be_2C, has given better results than BeO. Extrusion cladding and end sealing of Th tubes with Al has been successfully developed. In order to obtain satisfactory end seals it is necessary to use an Al–6 wt. % Mg alloy as the end plug and to preshape the Th in a complicated way. A smooth interface between core and clad can be achieved if the Th is sufficiently soft and if the billet has a fine grain size. Good bond strength can be achieved by maintaining a good vacuum inside the extrusion assembly and by using an optimum extrusion temperature and reduction ratio. Pins of U–2 wt. % Zr alloy clad with Zr have been heat treated for radiation stability both by melting the core and by heating into the gamma phase. Microstructures similar to that of the Argonne "chill cast" alloy may be produced by either procedure using appropriate cooling rates. The melted core gives the least growth in thermal cycling. Experiments on the reprocessing of U or Th fuels with molten metals are described. Favorable results on removal of Ru from U, U from Th, and Zr cladding from U are presented. The use of V as a container for molten Bi has been studied. The solubility of V in Bi at a given temperature is substantially higher than that of Croloy. Mass transfer of V readily occurs. Sodium also attacks V at high temperatures. The electrical and thermal conductivity of a number of Zr and Ti alloys have been measured. Aluminum is the most effective element in lowering the conductivities. The problem of producing ferrites suitable for use in large accelerators is being studied. A method has been developed whereby Zr cladding can protect U from corrosion in 650°F water even when small holes exist in the Zr. The procedure is to get a thick diffusion layer between the core and clad. (For preceding period see NMI-1134.) (auth)

12491 NMI-2028
Nuclear Metals, Inc., Cambridge, Mass.
FUNDAMENTAL AND APPLIED RESEARCH AND DEVELOPMENT IN METALLURGY. Progress Report for November 1954. Nov. 30, 1954. Decl. Feb. 28, 1957 8p. Contract AT(30-1)-1565. $1.80(ph OTS); $1.80(mf OTS).

The status of work on Th, U, and Zr metallurgy, corrosion studies, and Al alloy development is briefly reported. (J.E.D.)

12492 NYO-1115
Brush Beryllium Co., Cleveland.
THE FABRICATION OF THORIUM BY POWDER METALLURGY. J. G. Klein and K. G. Wikle. Nov. 30, 1952. 39p. Decl. Mar. 25, 1957. 39p. Contract AT-(30-1)-541. $0.40(OTS).

Thorium powder obtained from lathe turnings and saw chips by the thorium hydride process has been successfully pressed at room temperature with various pressures ranging from 30 to 85 tsi. Also vacuum hot pressing of saw chips and lathe turnings has yielded metal with up to 99% of maximum density. Ultimate tensile strength and yield strength of extruded compacts compare favorably with those of fabricated cast thorium while per cent reduction and percent contraction of area are lower. (auth)

12493 NYO-1185
National Research Corp., Cambridge, Mass.
THE CONTAMINATION OF MOLTEN THORIUM BY ZIRCONIA AND BERYLLIA CRUCIBLES. James H. Moore. Apr. 23, 1952. Decl. Mar. 12, 1957. 7p. $1.80(ph OTS); $1.80(mf OTS).

Dezinced Th was melted in beryllia and in zirconia crucibles by means of a metal tank-type vacuum furnace containing an induction-coil assembly for a crucible ~$2\frac{3}{4}$ in. in diameter and 5 in. high. Heating was done at as rapid a rate as possible, and all melts were held at soak temperature, 1750 to 1900°C, for 30 min. The melt was then allowed to solidify in the crucible. Correlation between temperature and degree of contamination and relative contamination by zirconia and beryllia are discussed. (J.E.D.)

12494 ORNL-216
Oak Ridge National Lab., Tenn.
PRODUCTION OF AN Al CLAD URANIUM–ALUMINUM ALLOY TUBE. Problem Assignment TD-51. C. D. Smith. Nov. 26, 1948. Decl. Mar. 6, 1957. 8p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Procedures are described for the fabrication of an Al-clad U–Al tube, 3.1 in. mean diameter by 12 in. long, containing 105 gms of 93.5% enriched U^{235}. Changes in technique are recommended for any similar future work. (auth)

12495 ORNL-1090
Oak Ridge National Lab., Tenn.
METALLURGY OF THORIUM AND THORIUM ALLOYS. Interim Report [for] July 1, 1949 to July 1, 1951. D. E. Hamby. Dec. 7, 1951. Decl. Mar. 4. 1957. 93p. Contract W-7405-eng-26. $0.60(OTS).

A comprehensive study has been made of the physical metallurgy of Th and some of its alloys. Mechanical properties such as tensile strength, ductility, modulus of elasticity, Poisson's ratio, shear modulus, and impact strength were determined for Ames Ca-reduced Th. A few tests were made on iodide Th and Westinghouse powder-compacted Th. Density determinations are reported for Ames, iodide, and Westinghouse Th samples. Precision measurements of the lattice parameters of iodide Th made by x-ray diffraction are given. Work-hardening characteristics and recrystallization temperatures were established for both Ames and iodide Th. The fabricating characteristics of Th were studied by rolling, swaging, extrusion, forging, and welding. Cladding of Th with Zr was accomplished by extrusion. Thermal cycling of Th was carried out in NaK at temperatures of 100 to 500°C to investigate dimensional stability. A preliminary investigation is reported on binary Th alloys containing additions of Be, Si, Zr, Ti, Al, Nb, Cr, Mn, and Ce. Melting ranges, fabricating characteristics, hardness, and tensile properties were studied. Ternary alloys containing Zr–Ti and Zr–Si were investigated in like manner. Corrosion tests in water at 95°C were carried out on Ames Th and all the alloys under study. (auth)

12496 SEP-14
Sylvania Electric Products Inc., Bayside, N. Y.
THE DEVELOPMENT OF UNIFORM DISTRIBUTION OF URANIUM IN BERYLLIUM BY MEANS OF POWDER METALLURGY. PART II. R. P. Angier and H. H. Hausner. May 26, 1949. Decl. Mar. 1, 1957, 21p. Contract AT-30-1-Gen-366. $3.30(ph OTS); $2.40(mf OTS).

A uniform distribution of UBe_9 particles in a matrix of

Be sintered to 91.5% of the ideal density of the mixture of 33 wt. % UBe_9 and 67 wt. % Be was obtained and confirmed. The effects of UBe_9 particle size, rate of heating, and the sintering temperature on the particle dispersion were investigated. (C.W.H.)

12497 SEP-39
Sylvania Electric Products Inc., Bayside, N. Y.
HIGH-DENSITY URANIUM BY HOT-PRESSING OF METAL POWDER. Henry H. Hausner and Norman P. Pinto. Nov. 17, 1950. Decl. Mar. 18, 1957. 6p. Contract AT-30-1-gen-366. $1.80(ph OTS); $1.80(mf OTS).

Uranium powder made from uranium hydride, when hot-pressed in vacuum results in a pore-free material, the structure of which consists of randomly oriented, fine grains. These uranium compacts contain 0.007 to 0.09% oxygen. The density of uranium containing small amounts of oxygen was calculated, and the data were compiled in graph form. The effect of hot-pressing time on the density of uranium compacts was studied. (C.W.H.)

12498 SEP-88
Sylvania Electric Products Inc., Bayside, N. Y.
A STUDY OF PREFERRED ORIENTATION TECHNIQUES. Warren P. Chernock and L. W. Kates. April 21, 1952. Decl. Mar. 7, 1957. 33p. Contract AT(30-1)-GEN-366. $0.40(OTS).

Existing methods of determining preferred orientation in hot-pressed U rods were critically examined with respect to sensitivity, speed, and convenience. A description is given of a method which is capable of detecting small degrees of preferred orientation. (T.R.H.)

12499 SEP-107
Sylvania Electric Products, Inc. Atomic Energy Div., Bayside, N. Y.
MONTHLY TECHNICAL PROGRESS REPORT FOR OCTOBER 20, TO NOVEMBER 20, 1952. Dec. 12, 1952. Decl. Mar. 18, 1957. 15p. Contract AT-30-1-GEN-366. $3.30(ph OTS); $2.40(mf OTS).

Progress is briefly reported on the following studies: properties of Sn–Zr alloys, powder metallurgy of corrosion-resistant Zr, U slug and slug canning development, high-temperature fuel elements, powder metallurgy of Th, preparation of Be, and preparation of UH_4. (L.T.W.)

12500 SO-3000
Rensselaer Polytechnic Inst. Powder Metallurgy Lab., Troy, N. Y.
ELECTRIC RESISTANCE SINTERING. A. B. Backensto, Jr., N. F. Hopson, and F. V. Lenel. July 31, 1950. Decl. Mar. 12, 1957. 24p. Contract AT(30-3)-37. $4.80(ph OTS); $2.70(mf OTS).

Descriptions are given of the following: (1) the extrusion of green compacts consisting of a core of either Fe or Th in an Al matrix and a case of pure Al, (2) the resistance sintering of Zr powder compacts and their properties, and (3) a comparison between the properties of Ti compacts resistance sintered in air and in argon. (auth)

12501 WAPD-CTA(EML)-199
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
SUMMARY OF BETTIS EXPERIENCE WITH SEAL WELDING MACHINES. J. J. Gertz. Jan. 18, 1957. 3p. $1.80(ph OTS); $1.80(mf OTS).

12502 WAPD-PWR-FEm-78
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
URANIUM–12 w/o MOLYBDENUM HOMOGENEITY AND DENSITY. E. S. Foster. Jan. 21, 1956. 11p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

The casting of U–12 wt. % Mo in graphite molds is described. Homogeneity to within 12.0 ± 0.3 wt. % Mo was maintained. Consumable remelting improved the density ~0.05 g/cc. (T.R.H.)

PHYSICS

12503 CF-56-7-61
Oak Ridge National Lab., Tenn.
ZIRCONIUM-95 AS A FISSION MONITOR. W. A. Brooksbank, Jr. July 17, 1956. Decl. Mar. 13, 1957. 4p. Contract [W-7405-eng-26.] $1.80(ph OTS); $1.80 (mf OTS).

A study is reported to determine the feasibility of using Zr^{95} (instead of Cs^{137}) as a fission monitor. Two samples of enriched uranium were irradiated and allowed to decay for 10 d before analysis. Cs^{137} and Zr^{95} were separated, counted, and the fission values obtained were compared. (L.T.W.)

12504 KAPL-1346
Knolls Atomic Power Lab., Schenectady, N. Y.
REPORT OF THE NUCLEAR PHYSICS SECTION FOR MARCH, APRIL, MAY 1955. Decl. Mar. 14, 1957. 43p. Contract W-31-109-Eng-52. (Deleted version: AECD-3792). $0.30(OTS).

The neutron capture-to-fission ratio was measured for a 5000 ev shielded U^{235} sample and found to be, for a mean fission energy of 15 kev, 0.406. The schematic diagram of the new three-stage mass spectrometer is given. An anticoincidence scintillation spectrometer, which is being applied to the quantitative analysis of gross fission-product mixtures is described. Plans are being made to build a high-precision magnetic alpha analyzer. Pu^{239} fission and absorption cross sections and temperature coefficients of reactivity are analyzed. The average of a Breit-Wigner resonance over a Maxwellian neutron spectrum is made. An extension has been made to the theory of atomic displacements produced by irradiation in a solid, improving agreement with experiment. The effects of monoenergetic fast neutron on normal and gold-doped Ge was studied. (W.L.H.)

12505 LA-1581
Los Alamos Scientific Lab., N. Mex.
HYDROGEN SLOWING-DOWN METHOD FOR CRITICALITY CALCULATIONS. Philip J. Bendt. Sept. 1953. Decl. Apr. 1, 1957. 18p. Contract W-7405-eng-36. $3.30(ph OTS); $2.40(mf OTS).

A criticality equation is derived assuming slowing-down only by hydrogen. The use of criticality experiments as a basis for calculation is described. Approximate methods are given for handling inhomogeneities and multi-region reactors. Some criticality data on solutions of UO_3 dissolved in H_3PO_4 are listed, and the Goertzel-Selengut equations are derived. (auth)

12506 LA-1716
Los Alamos Scientific Lab., N. Mex.
INSTABILITY OF A PINCHED FLUID WITH A LONGITUDINAL MAGNETIC FIELD. M. Kruskal and J. L. Tuck. Nov. 1953. Decl. Apr. 2, 1957. 42p. Contract [W-7405-eng-36]. $6.30(ph OTS); $3.00(mf OTS).

The stability of a pinched plasma equilibrium with a longitudinal magnetic field superimposed on the characteristic azimuthal magnetic field of the pinch current is studied theoretically. The linearized solutions are developed as helical perturbations of the plasma surface, and the behavior of these is given for the different cases of uniform longitudinal, longitudinal field zero inside the

plasma, and for helices of the same and opposite sense to the helix which describes the total magnetic field. Very approximately, the conclusions are: that the longitudinal field has the effect of stabilizing short wave perturbations, but that some long wave perturbations remain unstable no matter how large the externally imposed longitudinal magnetic field. (auth)

12507 LRL-109
California Research and Development Co. Livermore Research Lab., Livermore, Calif.
SOME ASPECTS OF THE PRODUCTION OF URANIUM-233 BY THE IRRADIATION OF THORIUM-232 WITH THERMAL NEUTRONS. T. E. Hicks and W. H. McVey. Mar. 1954. Decl. Feb. 27, 1957. 21p. Contract AT(11-1)-74. $0.25(OTS).

Within a system for the production of U^{233} by thermal neutron irradiation of Th^{232}, the relative importance of fission and capture on U^{233} production and production of neutrons from U^{233} fission is studied. The maximum concentration of U^{233} in Th^{232}, where the rate of U^{233} destruction equals production, is found to be 11,500 grams per metric ton. Thirty percent neutron loss is found to be the point at which the ratio of productive U^{233} atoms to neutrons entering the lattice stops increasing with U^{233} concentration and starts decreasing. U^{233} concentrations less than 2000 grams per metric ton are found to have little effect on the production lattice efficiency. (auth)

12508 NAA-SR-1432
North American Aviation, Inc., Downey, Calif.
REACTOR PHYSICS QUARTERLY PROGRESS REPORT [FOR] FEBRUARY–APRIL 1955. Richard A. Laubenstein, ed. Sept. 1, 1955. Decl. Mar. 1, 1957. 20p. Contract AT-11-1-GEN-8. $0.30(OTS).

The effect of photoneutrons on the buckling measurements made with exponential assemblies of D_2O lattices has been considered. These photoneutrons are produced by the gamma rays which originate in the Water Boiler Neutron Source used for exponential experiments at NAA. It was concluded that the effect of photoneutrons from source gamma rays was negligible. Exponential experiments have been completed for three lattices of 1-inch diameter uranium rods in a graphite moderator. A 9.5-inch square lattice was used with uranium enrichments of 0.49, 0.71, and 0.90 weight per cent U^{235}. Additional measurements have been made on the relaxation length of thermal neutrons in graphite thermal columns which contain long cylindrical air channels. Danger coefficient tests using the Water Boiler Reactor have included the following measurements: an extension of the data on the effective cross section of uranium of various enrichments, a survey of representative samples of SRE fuel material, and tests on samples of uranium oxides. The tests on samples of the SRE fuel gave results for the relative U^{235} enrichment which agree within the quoted errors with mass spectrographic analyses of samples from the ingots from which the slugs were made. The tests on natural uranium oxide samples indicate that the Water Boiler Reactor gives a better measure of the impurity content of uranium oxide than the "shotgun" method of testing. Ignition of the oxide before testing was found to be necessary in order to remove the water content. (auth)

12509 TID-5451
Dow Chemical Co. Rocky Flats Plant, Denver.
AN EMPIRICAL METHOD FOR CALCULATING SUBCRITICAL PIPE INTERSECTIONS. C. L. Schuske. July 17, 1956. Decl. Mar. 14, 1957. 4p. Contract AT(29-1)-1106. (TG-7.1). $1.80(ph OTS); $1.80(mf OTS).

12510 WAPD-CTA(RM)-312
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
FRICTION FUNDAMENTALS OUTLINE. N. B. Dewees. Nov. 29, 1955. 19p. Project 26c15. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

12511 WAPD-T-173
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]
MAGNETIC LATCH ANALYSIS (thesis). John G. Murray. Aug. 19, 1955. 73p. $12.30(ph OTS); $4.50(mf OTS). Submitted to Univ. of Pittsburgh.

INSTRUMENTS

12512 KAPL-M-EDL-54
Knolls Atomic Power Lab., Schenectady, N. Y.
CALIBRATION OF STEAM GENERATOR PITOMETER. R. H. Putnam and D. J. Eldredge. Feb. 1, 1954. 13p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

ISOTOPE SEPARATION

12513 ORNL-2097
Oak Ridge National Lab., Tenn.
CHEMICAL SEPARATION OF ISOTOPES SECTION SEMI-ANNUAL PROGRESS REPORT FOR PERIOD ENDING DECEMBER 31, 1955. July 24, 1956. Decl. Mar. 19, 1957. 42p. Contract W-7405-eng-26. $0.40(OTS).

The anisole-complex system utilizes the exchange reaction between BF_3 gas and the liquid BF_3 anisole complex to concentrate B^{11} in the gas phase and B^{10} in the liquid phase. The properties of Pt metal catalysts for catalysis of the hydrogen–water exchange was studied and exchange rates determined. A simple method was developed for the determination of deuterium in H compounds. The equilibrium constant for the isotopic exchange of N between NO and NO_2 was determined by mass spectroscopic measurements. A 15-mm exchange column for the enrichment of N^{15} by the Nitrox Process was operated and an over-all enrichment greater than fiftyfold or 16% was realized. The single-stage separation factor between O^{16} and O^{18} in the methyl ether(g)–methyl ether·BF_3 (l) system was found to be 1.107 ± 0.005 at room temperature. The heavy isotope concentrated in the liquid complex. (J.E.D.)

MASS SPECTROGRAPHY

12514 K-1083
Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.
MEASUREMENT OF THE URANIUM HEXAFLUORIDE FLOW INTO MASS SPECTROMETERS. Ernest C. Evans. Dec. 18, 1953. Decl. Mar. 27, 1957. 14p. Contract W-7405-eng-26. $0.25(OTS).

Gaseous UF_6 flowing into mass spectrometers was collected for measured periods of time by condensing into cold traps. The quantity of UF_6 was determined by an α count of the contents of the trap. Flow rates from 0.58 to 5.6 mg/hr of UF_6 were measured on two spectrometers. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

12515 MTR-L-231
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
GAMMA RAY SCANNING OF SPENT FUEL ASSEMBLIES.

Thomas J. Parmley. Oct. 22, 1953. Decl. Mar. 7, 1957. 14p. Contract AT(10-1)-205. $3.30(ph OTS); $2.40(mf OTS).

Equipment was built for determining the amount of U^{235} fissioned in fuel assemblies after the assemblies had been in the MTR and then released into a canal of water. These determinations give the U^{235} burn-up. (F.S.)

12516 STR-IR-39

[Westinghouse Electric Corp. Atomic Power Div., Idaho Falls, Idaho.]

EVALUATION OF RADIATION MONITORING EQUIPMENT. Information Report on T-Spec 474938. J. R. Horan. July 1955. Decl. Mar. 9, 1957. 20p. $3.30(ph OTS); $2.40 (mf OTS).

The efficiency and worth of each of the STR radiation monitoring set detection channels are determined. (auth)

12517 TID-5144

California. Univ., Los Angeles. Atomic Energy Project.

DEVELOPMENT OF CHEMICAL SYSTEMS APPLICABLE TO PRODUCTION OF THE ARMY TACTICAL AND ORGANIZATIONAL DOSIMETERS. Quarterly Report No. 3 [for] Jan. 1, 1953-Apr. 1, 1953. George V. Taplin, Clayton H. Douglas, Sanford C. Sigoloff, Donald Wales, Donald Paglia, and Charles Heller. Apr. 1, 1953. Decl. Mar. 4, 1957. 41p. Contract AT-04-1-GEN-12. $7.80(ph OTS); 3.30(mf OTS).

Fifteen thousand experimental dosimeters were prepared, calibrated, and sent to the Nevada Proving Grounds for test purposes. The chloroform-resorcinol system, as tested independently by the N.B.S., exhibited no evidence of dosage-rate dependency from rates ranging between 100 to 4,250 r/min. The same system tested simultaneously with N.B.S. film pack standards under three separate bomb explosions registered exposure values equal to or 10 to 20% higher than the film, further demonstrating that this system is not dosage-rate dependent. Independent comparative studies at Oak Ridge demonstrated that chloroform-resorcinol dosimeters register accurately, and cumulatively, repeated exposures of Co^{60} γ radiation as checked by Victoreen ionization chamber measurements. Tetrachloroethylene-inhibitor-dye systems were shown to be temperature independent for nearly all practical purposes. By varying the energy of radiation, it was demonstrated that correlation exists between mortality in albino mice and acid formation from chloroform-dye systems. Laboratory and bomb exposure data confirmed previous findings that chloroform systems are relatively insensitive to both fast and slow neutron exposures throughout dosage ranges having medical significance. Dosimeter systems capable of registering 1.0- to 2.0-r exposure of x radiation having energies comparable to those encountered following contaminating bomb explosions were prepared from tetrachloroethylene-resorcinol systems. Arrangements were made and projects are underway to conduct numerous field experiments in Nevada to obtain data correlating the effects of both prompt and residual γ radiation and/or fast neutrons on various biological, chemical, photographic, and physical dosimetric systems. Prototype Army Technical Dosimeters were made, calibrated, and given preliminary field tests. (For preceding period see AECU-2574.) (auth)

NUCLEAR PHYSICS

12518 N-1886

Clinton Labs., Oak Ridge, Tenn.

THE NEUTRINO. L. B. Borst. Jan. 31, 1945. Decl. Mar. 18, 1957. 10p. $3.30(ph OTS); $2.40(mf OTS).

Known properties of the neutrino are briefly summarized. It is suggested that the existence of a health hazard due to the emission of neutrinos from Hanford reactors must be considered as a distinct possibility, and estimates of such a hazard are discussed. (B.J.H.)

NUCLEAR PROPERTIES

12519 KAPL-M-DCS-2

Knolls Atomic Power Lab., Schenectady, N. Y.

SELECTION OF A LOW NEUTRON ACTIVATION METAL FOR ACTIVATION WIRES. D. C. Sherman. May 18, 1954. 16p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40 (mf OTS).

Calculations and conclusions are presented relative to the selection of a basic material for activation wires intended for the mapping of the S3G reactor power and neutron flux in the power range. (auth)

NUCLEAR REACTORS

12520 AECD-4164

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

SPECIFICATION FOR CLEANING ZIRCALOY FUEL ROD COMPONENTS. R. L. Fischer. May 6, 1956. Decl. Mar. 18, 1957. 4p. $1.80(ph OTS); $1.80(mf OTS).

Specifications for cleaning Zircaloy-2 components of PWR fuel rods, tools, and other equipment are given. (T.R.H.)

12521 ANL-4590(Del.)

Argonne National Lab., Lemont, Ill.

NEUTRON PRODUCER (CP-6) PROGRAM. TECHNICAL PROGRESS LETTER. Stuart McLain, comp. Feb. 28, 1951. Decl. with deletions Feb. 12, 1957. 21p. Contract W-31-109-eng-38. $3.30(ph OTS); $2.40(mf OTS).

12522 BMI-841(Del.)

Battelle Memorial Inst., Columbus, Ohio.

CORE SHAPE OF FUEL ELEMENTS CLAD WITH ZIRCONIUM ALLOY. J. W. Holladay, J. G. Kura, and J. H. Jackson. June 11, 1953. Decl. Mar. 6, 1957. 31p. Contract W-7405-eng-92. $4.80(ph OTS); $2.70(mf OTS).

The fabrication of Zircaloy-clad Sn-U-Zr fuel elements by roll-cladding was studied. It was found that the core should contain as much tin as the clad. (T.R.H.)

12523 BMI-942

Battelle Memorial Inst., Columbus, Ohio.

DEVELOPMENT OF METHODS FOR SEALING ENDS OF PWR FUEL RODS. J. J. Vagi and D. C. Martin. Aug. 16, 1954. Decl. Feb. 26, 1957. 30p. Contract W-7405-eng-92. $4.80(ph OTS); $2.70(mf OTS).

As part of the WAPD program for developing fuel rods for PWR, methods for sealing the ends of Zircaloy 2-clad, uranium-12 wt. % molybdenum-cored fuel rods made by coextrusion were investigated. Attempts were made to join Zircaloy 2 end plugs to the rod by means of pressure bonding, resistance welding, and fusion welding. Exploratory tests indicated that resistance upset welding was promising. Tension-test fractures occurred in the Zircaloy 2 end caps away from the weld joint when materials were vacuum treated prior to upset welding. Percussion welding and flash welding were eliminated from extensive consideration because molten core alloy was extruded out along the clad end-cap bond line when these processes were used. Attempts to fusion weld an overlap on the ends of the fuel rods resulted in end seals that had uranium at the surface and also contained gas porosity. (auth)

12524 BMI-T-40
Battelle Memorial Inst., Columbus, Ohio.
JACKETING OF URANIUM FOR HIGH-TEMPERATURE SERVICE. I. HIGH-TEMPERATURE FUEL RODS. H. A. Saller and J. T. Stacy. Sept. 30, 1950. Decl. Feb. 14, 1957. 29p. Contract W-7405-eng-92. $0.30(OTS).

A portion of the experimental work on jacketing U for service at high temperatures is described. In particular, progress on the fabrication of a U-containing metallic fuel rod for operation in air at 1090°C is reported. The following principal points are discussed: the usefulness of stainless steel jackets; the need, advantages, and methods of applying a barrier coat; the necessity for U alloy cores rather than pure U cores; methods of assembling the jacketed assembly; and high-temperature exposure tests. (L.T.W.)

12525 BNL-24(Del.)
Brookhaven National Lab., Upton, N. Y.
LECTURES ON NUCLEAR SCIENCE AND ENGINEERING NOVEMBER 16, 1948 TO FEBRUARY 1, 1949. 153p. $24.30(ph OTS); $7.50(mf OTS).

Lectures prepared for a survey course on reactor theory, design, operation, and experimentation are presented. General reviews of neutron and fission physics are made and the Brookhaven Reactor design, engineering, and operation are discussed. (D.E.B.)

12526 BNL-194
Brookhaven National Lab., Upton, N. Y.
THE CHALK RIVER TRANSIENT OF JUNE 30, 1948 AND U^{233} FISSION. M. Clark. July 1952. Decl. Apr. 12, 1957. 12p. $0.35(OTS).

The 20.8-min pile reactivity transient observed in earlier Chalk River experiments and interpreted as due to the direct formation of an isomer of Xe^{135} was reanalyzed. It was assumed that U^{233} may undergo fission and that there is no directly formed Xe^{135} isomer. A value of the fission yield of I^{135} is obtained which is in good agreement with the values obtained by chemical methods. The analysis yields a value of about 35,000 barns for $[\eta-A]\ \sigma_a(U^{233})$, where A is a constant slightly greater than unity, η is the number of fission neutrons per neutron absorbed in uranium, and $\sigma_a(U^{233})$ is the thermal absorption cross section of U^{233}. Reasons for the unreliability of cross-section values are cited. (auth)

12527 CF-49-8-231
Oak Ridge National Lab., Tenn.
HEAT EXCHANGER ANALYSIS FOR THE HOMOGENEOUS POWER REACTOR PILOT PLANT—STUDY I. Charles L. Segaser. Aug. 23, 1949. Decl. Feb. 13, 1957. 24p. Contract [W-7405-eng-26]. $0.35(OTS).

Heat exchange theory is reviewed, and the special requirements for use with radioactive $UO_2SO_4 - H_2O$ solutions from homogeneous reactors are considered. A heat exchanger design for use with the homogeneous power reactor pilot plant operating at 250°C is suggested. (D.E.B.)

12528 CF-51-8-193(Rev.)
Oak Ridge School of Reactor Technology, Tenn.
RESEARCH AND ISOTOPE PRODUCING REACTOR—REACTOR DESIGN AND FEASIBILITY PROBLEM. J. Dutton, G. G. Leeth, E. E. Mason, W. S. Hogan, E. S. Wilson, and D. L. Martin. Aug. 6, 1951. Decl. Mar. 20, 1957. 64p. $0.50(OTS).

A cylindrical, low cost, H_2O moderated, H_2O reflected, enriched U reactor design for university use is given. (M.H.R.)

12529 CF-53-1-28
Oak Ridge National Lab., Tenn.
STUDIES OF STRAIGHT THROUGH MODELS WITH MULTIPLE INLET JETS. L. B. Lesem. Jan. 2, 1953. Decl. Mar. 26, 1957. 11p. Contract [W-7405-eng-26]. $1.80 (ph OTS); $1.80(mf OTS).

Several fuel circulation systems for a homogeneous reactor core are described and evaluated. (L.T.W.)

12530 CF-53-8-225
Oak Ridge School of Reactor Technology, Tenn.
A HOMOGENEOUS, NON-BOILING, NATURAL CONVECTION POWER REACTOR. Reactor Design and Feasibility Problem. William E. Kinney, Robert Brodsky, David Hillis, John T. Wagner, and Thomas J. Ward. Aug. 1953. Decl. Mar. 16, 1957. 112p. $1.00(OTS).

A feasibility study of a homogeneous, natural convection, non-boiling reactor with 7 Mw average heat output, 0.7 Mw average electrical power production and 1.8 Mw average space heating capacity is presented. It would be used to supply power in remote areas. (T.R.H.)

12531 CF-53-10-23
Oak Ridge School of Reactor Technology, Tenn.
A PRELIMINARY DESIGN STUDY OF A 10 MW HOMOGENEOUS BOILING REACTOR POWER PACKAGE FOR USE IN REMOTE LOCATIONS. R. J. Rickert, W. C. Gribble, B. A. Mong, R. G. Stater, and J. J. Wesbecher. Aug. 21, 1953. Decl. Feb. 22, 1957. 150p. $0.75(OTS).

12532 CF-53-11-65
Oak Ridge National Lab., Tenn.
PROGRESS REPORT ON POWER REMOVAL FROM HOMOGENEOUS BOILING REACTORS. R. V. Bailey. Nov. 4, 1953. Decl. Apr. 8, 1957. 47p. Contract [W-7405-eng-26]. $7.80(ph OTS); $3.30(mf OTS).

A series of experiments to evaluate several power removal techniques is reported. The data are given in connection with research described in CF-53-11-145. For additional information on this subject, see "Power Removal From Homogeneous Boiling Reactors," Reactor Science and Technology, Vol. 4, No. 2, TID-2013. (K.S.)

12533 CF-54-1-81
Oak Ridge School of Reactor Technology, Tenn.
U-233 POWER-BREEDER REACTOR. Reactor Design and Feasibility Problem. R. R. Halik, L. H. Beckberger, J. M. Halbeck, J. E. Mealia, W. A. Northrop, D. R. Rees, and W. A. Robba. [Jan. 1954]. Decl. Mar. 15, 1957. 262p. $1.60(OTS).

The fluidized solids technique, used so extensively in the petroleum and chemical industries, has been investigated for possible adaptation to nuclear power-breeder reactors. Several designs were studied and detailed engineering and nuclear calculations are presented on the design considered to have the greatest promise for a large electric power station. Basically, the design calls for the circulation of solid particles consisting of a fuel-moderator mixture, from the core to a separate heat exchanger vessel from which the solids flow freely to and through the core by gravity. Argon, at essentially atmospheric pressure is recommended as the gas to be used in circulating the solids and fluidizing them in the heat exchanger. The blanket, consisting of solid particles of moderator and fertile material, is separated from the core region by means of a graphite shell and is fluidized by a separate gas stream. Among the advantages of this system are the high breeding gain obtainable, utilization of basic engineering principles presently in use in industry, and the ability to produce steam at pressures and temperatures comparable to those presently available to the power industry. Nuclear calculations were made using 2-group 2-region method. A typical system, operating at 250 Mw (heat output) and producing over 80 Mw electrical power, requiring a 10.5 foot (diameter) core, a 3-foot thick blanket, and 48 Kg of U^{233} in the

core proper, is discussed. Additional holdup of fuel in the heat exchanger and blanket brought the total fuel inventory to somewhat less than 200 Kg. Breeding gains of over + 0.2 were calculated even after consideration was given to the poisons, leakage, and core shell adsorption. (auth)

12534 CF-54-8-238(Del.)
Oak Ridge School of Reactor Technology, Tenn.
BOILING HOMOGENEOUS REACTOR FOR PRODUCING POWER AND PLUTONIUM. Reactor Design and Feasibility Problem. H. J. Kamack, P. J. Flickinger, F. C. Haag, P. B. Haga, R. G. McGrath, B. R. Moskowitz, D. E. Murphy, and R. B. Nicholson. Aug. 1954. Decl. with deletions May 9, 1957. 152p. $24.30(ph OTS); $7.50(mf OTS).

A preliminary study was made of boiling, homogeneous, uranium-fueled reactor systems. Optimum design conditions for economical power are given. The cost is comparative with a non-boiling forced-circulation homogeneous reactor system. The feasibility depends principally on the unsteady-state behavior. This and other important design and operating problems are discussed. (auth)

12535 CF-55-5-156
Oak Ridge National Lab., Tenn.
HRT PROCESS FLOWSHEETS. F. C. Zapp. May 26, 1955. Decl. Apr. 1, 1957. 31p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

12536 CF-55-11-94
Oak Ridge National Lab., Tenn.
ELEMENT AFTER HEATING. K. M. Henry and J. N. Anno. Nov. 11, 1955. 3p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Measurements of radioinduced heating were made on MTR-type fuel elements after operation at 400 kw for 4 hrs, 23 min, and 1 mw for 4 hrs, 23 min. Measurements were recorded for a period of 2 hrs. (D.E.B.)

12537 CF-56-1-142
Oak Ridge National Lab., Tenn.
DEUTERIUM EXPLOSION HAZARD IN HRT UNDERFLOW POT. Herman O. Weeren. Jan. 18, 1956. Decl. Mar. 13, 1957. 18p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The underflow pot of the HRT chemical processing system serves to collect the solids separated from the process solution. Studies were conducted to determine the volumes of D_2 and O_2 which might collect in the pot, and to determine the ability of the pot to confine an explosion. The results indicate any explosion would be contained, and that a 2-hr period was sufficient for catalytic recombination of the gases. (D.E.B.)

12538 CF-56-2-156
Oak Ridge National Lab., Tenn.
HRT-CP EXPERIMENTAL EVAPORATOR STUDIES. P. A. Haas, J. C. Bresee, and J. K. Langsdon. Feb. 27, 1956. Decl. Mar. 14, 1957. 35p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

Experimental evaporator studies were made for conditions representing the recovery of D_2O by evaporation from the HRP-CP hydroclone underflow pot product. The evaporation step with a volume heat source was relatively trouble free; the main problem encountered was the handling and transfer of the slurry of insoluble fission and corrosion products. (auth)

12539 CF-56-4-87
Oak Ridge National Lab., Tenn.
HRP-CP: SAMPLER OPERATION AND URANIUM PEROXIDE PRECIPITATION IN THE HRT CHEMICAL PROCESSING PLANT. William L. Carter. Apr. 11, 1956. Decl. Mar. 14, 1957. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

It was found that neither the overflow nor underflow sampler lines should be in danger of plugging from UO_4 precipitation. (T.R.H.)

12540 CF-56-4-124
Oak Ridge National Lab., Tenn.
PHASE III FUEL SAMPLE IRRADIATION. IRRADIATION REQUEST ORNL-21. F. H. Neill and R. C. Waugh. Apr. 12, 1956. Decl. Feb. 22, 1957. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The radiation damage to fuel material similar to that specified for the Army Power Package Reactor is studied. In particular, the effect of the method of preparing the UO_2 and various degrees of cold rolling upon the radiation damage were determined. The design, fabrication, and composition of these fuel plates are described in some detail. (T.R.H.)

12541 CF-56-5-126
Oak Ridge National Lab., Tenn.
MINUTES OF HRP MONTHLY INFORMATION MEETING APRIL 26, 1956. H. F. McDuffie. May 3, 1956. Decl. Mar. 13, 1957. 6p. Contract [W-7405-eng-26.] $1.80 (ph OTS); $1.80(mf OTS).

The ThO_2 slurry development program is briefly summarized. (D.E.B.)

12542 CF-56-6-56
Oak Ridge National Lab., Tenn.
COMPOSITION OF SOLIDS FROM HRT MOCKUP PRESSURIZER. D. M. Richardson. June 8, 1956. Decl. Mar. 14, 1957. 2p. Contract [W-7405-eng-26.] $1.80(ph OTS); $1.80(mf OTS).

12543 CF-56-6-168
Oak Ridge National Lab., Tenn.
FUEL SOLUTION FOR THE HRR. Robert A. McNees. June 28, 1956. Decl. Mar. 14, 1957. 2p. Contract [W-7405-eng-26.] $1.80(ph OTS); $1.80(mf OTS).

12544 CF-56-6-173
Oak Ridge National Lab., Tenn.
PHASE I ABSORBER ROD SAMPLE IRRADIATION. IRRADIATION REQUEST ORNL-MTR-28. F. H. Neill and C. F. Leitten, Jr. June 27, 1956. Decl. Mar. 19, 1957. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40 (mf OTS).

In order to evaluate the radiation damage to be expected in the APPR-1 absorber rods, a series of irradiation tests was initiated. The first five test samples containing 3.03 wt. % B were fabricated by powder metallurgical techniques and will be irradiated in the MTR to 20, 40, 60, 80, and 90% burnup. Calculations for determining the irradiation time for these burnup percentages are developed. (D.E.B.)

12545 CF-56-7-12
Oak Ridge National Lab., Tenn.
PRELIMINARY DESIGN OF AN IODINE REMOVAL SYSTEM FOR A 460-MW THORIUM BREEDER REACTOR. D. E. Ferguson. July 3, 1956. Decl. Mar. 12, 1957. 23p. Contract [W-7405-eng-26.] $4.80(ph OTS); $2.70(mf OTS).

12546 CF-56-7-49
Oak Ridge National Lab., Tenn.
HRP-BP: A MATHEMATICAL ANALYSIS OF THE HRT BLANKET PROCESSING PLANT. William L. Carter. July 16, 1956. Decl. Mar. 13, 1957. 21p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A mathematical analysis of the solid-liquid separation step for the HRT blanket processing facility is presented. (auth)

12547 CF-56-7-117
Oak Ridge National Lab., Tenn.
VOLUME CALIBRATION OF BLANKET HIGH-PRESSURE SYSTEM. Results of HRT Test III B 5a. N. W. Curtis and P. N. Haubenreich. July 30, 1956. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

12548 CF-56-7-149
Oak Ridge National Lab., Tenn.
MINUTES OF MEETING TO CLARIFY STATUS OF APPR-1 FUEL ELEMENTS. R. J. Beaver. July 27, 1956. Decl. Feb. 23, 1957. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The engineering status of APPR fuel plates is surveyed. Studies were conducted to resolve the problem of apparent carburization and sensitization of the fuel plates. Suggested corrective measures are also included. (T.R.H.)

12549 CF-56-11-52
Oak Ridge National Lab., Tenn.
A PRELIMINARY ECONOMIC EVALUATION OF ORGANIC MODERATED, HOMOGENEOUS POWER REACTORS. Paul R. Kasten. Nov. 2, 1956. Decl. Mar. 12, 1957. 20p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The use of deuterated-hydrocarbons in homogeneous power-breeder reactors appears uneconomical based on present data for both single and two-region systems. The power cost appears particularly high for single-region reactors because of the high rate of radiation damage suffered by the organic material. The incremental power cost associated with this radiation damage appears to be at least 10 mills/kw-hr in a system having an average power density of 10 kw/liter (this cost includes the associated fuel-processing cost); based on this study, the maximum incremental power-cost could be about 85 mills/kw-hr. (auth)

12550 CF-57-1-32
Oak Ridge National Lab., Tenn.
APPR-1 TYPE ABSORBER ROD IRRADIATION TEST—IRRADIATION REQUEST ORNL MTR-29. E. E. Gross and L. D. Schaffer. Jan. 4, 1957. Decl. Mar. 14, 1957. 35p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

An irradiation test program was established in order to evaluate the behavior of an APPR type absorber rod. The control rod was designed in accordance with APPR-1 control rod specifications. Calculations were made of the heat generation in the absorber rod and of absorber rod temperatures when in the pile. A recalculation of the inner plate surface temperature is included in an appendix. (M.H.R.)

12551 CLM-JRM-2
Clinton Labs., Oak Ridge, Tenn.
MIXED PILES. J. R. Menke. Mar. 10, 1947. Decl. Apr. 2, 1957. 15p. Contract [W-7405-eng-39]. $3.30(ph OTS); $2.40(mf OTS).

A pile is proposed for consideration in which a part of the fissions are caused by fast neutrons and a part by thermal neutrons. Preliminary calculations indicate that such a composite or "mixed" pile has advantages in size and controllability over similar fast piles at a cost to the neutron economy. Nevertheless, the example given is capable of breeding with a reasonable specific power. It contains a total of 86 kgs of U^{233} dispersed in Bi and in Be. (auth)

12552 HW-34082
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
REACTIVITY TEMPERATURE COEFFICIENT OF HIGH EXPOSURE FUEL. P. F. Gast. Dec. 13, 1954. Decl. Feb. 25, 1957. 5p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The presence of large amounts of Pu in high-exposure U will give rise to a large, positive, graphite reactivity, temperature coefficient. This will create control problems in normal operation and also in the event of loss of cooling. Some general suggestions are given for the solution of these problems. The magnitude of the coefficient is probably known within ±25% at present and a program is planned to reduce this uncertainty. The uncertainty is of minor importance in the operating control problem but of considerable significance in the disaster control problem. (auth)

12553 KAPL-95
Knolls Atomic Power Lab., Schenectady, N. Y.
HEAT TRANSFER, THERMAL STRESS AND NEUTRON DIFFUSION PHYSICS IN BARE PILES. H. E. Stevens, Jr. Oct. 27, 1948. Decl. Mar. 22, 1957. 18p. Contract W-31-109-Eng-52. $0.25(OTS).

The relationship between the critical mass of fuel, the reactor size, the power output, the coolant temperature rise, the plate thickness, the coolant passage thickness, the maximum allowable plate stress, and many other factors are shown graphically for a bare cylindrical thermal reactor. The internal structure assumed consists of uniformly spaced plates of homogeneous fuel-moderator alloy separated by a coolant and parallel to the axis of the cylinder. No corrections were made for the non-homogeneity of the pile. (auth)

12554 KAPL-116
Knolls Atomic Power Lab., Schenectady, N. Y.
PRELIMINARY FEASIBILITY REPORT ON THE KAPL REACTOR. Jan. 12, 1949. Decl. May 13, 1957. 109p. Contract W-31-109-Eng-52. $25.80(ph OTS); $7.80 (mf OTS).

The proposed reactor is a Na cooled, intermediate energy, power breeder. The various components of the reactor and associated equipment are described in detail. (D.E.B.)

12555 KAPL-340(Del.)
Knolls Atomic Power Lab., Schenectady, N. Y.
PROGRESS REPORT NO. 45 FOR APRIL 1950. SECTION III. REACTOR MATERIALS. May 29, 1950. Decl. with deletions Feb. 21, 1957. 31p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

The results are reported of research on the structure of graphite, self-diffusion of Be, the effect of O_2 on the hardness of V, annealing of extruded and arc-melted V, mechanical properties of V, transformation kinetics of Cr–U alloys, and corrosion of 347 stainless steel by Na. (T.R.H.)

12556 KAPL-M-EAL-16
Knolls Atomic Power Lab., Schenectady, N. Y.
FUEL ASSEMBLY FOR OXIDE-FUELED PLUTONIUM POWER BREEDER. E. A. Luebke. Dec. 17, 1954. Decl. Mar. 29, 1957. 9p. Contract W-31-109-Eng-52. $1.80 (ph OTS); $1.80(mf OTS).

The use of $\frac{1}{8}$- to $\frac{1}{4}$-in. diameter fuel elements is suggested for the reactor, thus making possible the consideration of thin-walled tubular spacers between the fuel rods. The Na coolant would be allowed to flow through the separator tubes as well as the usual space between the fuel elements. The fuel rods and separator tubes are supported on one end from narrow support strips. (M.H.R.)

12557 KAPL-M-EDL-33
Knolls Atomic Power Lab., Schenectady, N. Y.
CALROD INSERTION FORCES. C. C. Ripley. Feb. 21, 1953. 24p. Contract [W-31-109-eng-52]. $9.30(ph OTS); $3.60(mf OTS).

Calrod heating units will be inserted in bent conduits to

provide pre-heating for initial liquid metal filling of the reactor. Insertion and withdrawal forces must be determined in order to select a method of performing these operations. A full scale conduit was constructed. Tests show that two men can insert and withdraw molykoted calrods, provided that the minimum radius of conduit bends is 24" and the calrod tip is rounded to prevent gouging. Withdrawal before irradiation is assumed. (auth)

12558 KAPL-M-EDL-60
Knolls Atomic Power Lab., Schenectady, N. Y.
EFFECTIVE CONDUCTIVITY OF THE SHOT IN THE ROTATING PLUGS. J. M. Marshall and A. B. Briggs. Nov. 15, 1953. 12p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

The effective heat conductivity of shot with a film of oil in the rotating plugs of the SIR was found to be 0.966 Btu/°F-ft.-hour. (T.R.H.)

12559 KAPL-M-EDL-72
Knolls Atomic Power Lab., Schenectady, N. Y.
THERMAL SHOCK TESTS ON QUICK DISCONNECT UNIT. S. V. Larson and W. K. Watson. June 24, 1954. 17p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

12560 KAPL-M-EDL-122
Knolls Atomic Power Lab., Schenectady, N. Y.
SUMMARY OF SODIUM ACCEPTANCE TESTS PROTOTYPE S2G PRIMARY COOLANT STOP VALVES. T. Hannum and F. N. Schell. Sept. 20, 1956. 26p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

12561 KAPL-M-LML-2
Knolls Atomic Power Lab., Schenectady, N. Y.
HIGH SPEED MOTION PICTURES FOR CONTROL MOCK-UP. L. M. Loeb. Aug. 17, 1950. Decl. Mar. 7, 1957. 14p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40 (mf OTS).

High-speed pictures were taken to show the action of a control assembly in slow motion for a better analysis of performance and to have a permanent record of these performances and their variations with modification of equipment. (L.T.W.)

12562 KAPL-M-MHS-22
Knolls Atomic Power Lab., Schenectady, N. Y.
THE ANALYSIS OF THE TEMPERATURE AND THERMAL STRESSES IN THE BERYLLIUM OF SIR FUEL ELEMENT CORE ROD. M. H. Shackelford. Jan. 4, 1954. Decl. Mar. 9, 1957. 15p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

12563 KAPL-M-MSN-4
Knolls Atomic Power Lab., Schenectady, N. Y.
THERMAL UTILIZATION IN AN INFINITE ARRAY OF PLANE THERMAL ABSORBERS. M. S. Nelkin. June 1, 1956. 11p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

An infinite array of thin plane foils separated by a distance "l" are considered. The foils are assumed to absorb only at thermal energies and to contain fissionable material. To simplify the mathematics the foils are assumed to have zero geometrical thickness, but to have a transmission, T, for thermal neutrons which differs from unity. The lack of epithermal absorption allows the use of infinite medium slowing-down kernels. The thermal neutrons are treated by diffusion theory in a single group. The thermal utilization is calculated in the absence of a buckling, and the effect of a buckling is discussed. Application are made to the loading of the PPA. (auth)

12564 KAPL-M-NGM-2
Knolls Atomic Power Lab., Schenectady, N. Y.
DISTRIBUTION OF URANIUM AND URANIUM OXIDE IN LIQUID METAL THERMAL CONVECTION LOOPS. N. G. Mills and R. F. Koenig. Jan. 23, 1951. Decl. Mar. 9, 1957. 12p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Two tests were performed in Na thermal convection loops to obtain on indication of (1) where U or UO_2 would deposit in the SIR system in the event of a fuel pin failure and (2) how the dispersed fuel could be removed. It was also hoped that the results might apply as well to fission products since they appeared to accompany U in the experiment. (L.T.W.)

12565 KAPL-M-RCD-29
Knolls Atomic Power Lab., Schenectady, N. Y.
REMOVAL OF PERCHLORETHYLENE FROM BLIND ACCESS HOLES BY USE OF VACUUM AND HEAT. Max E. Thiebaud and C. W. Donnelly. APPENDIX I: MINUTES OF MEETING TO DISCUSS CLEANING OF REACTOR PARTS HELD IN BUILDING D-4 ON DECEMBER 3, 1954. R. G. Townsend. Dec. 6, 1954. APPENDIX II: DRYING TIME FOR PERCLENE TRAPPED IN BLIND HOLES BY THE USE OF HEAT AND VACUUM. C. W. Donnelly. Dec. 15, 1955. APPENDIX III: DETERMINATION OF RESIDUAL CHLORIDE UPON VACUUM EVAPORATION OF PERCLENE SOLVENT. C. W. Donnelly. Jan. 11, 1955. 7p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

12566 KAPL-M-RCR-1
Knolls Atomic Power Lab., Schenectady, N. Y.
INITIAL ANARPA PPA LOADING (PPA-34). R. C. Rohr. July 2, 1956. 20p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

The initial loading of the PPA for ANARPA experiments is described. The reactor discussed is a two region reactor which has a flat radial power distribution and a cosine longitudinal distribution. Details of the geometry, composition, instrumentation and loading curves are given. Results of some safety studies are also included. (auth)

12567 KAPL-M-RLN-2
Knolls Atomic Power Lab., Schenectady, N. Y.
MSA PLUGGING TESTS ON ROTATING PLUG SIMULATOR. R. L. Neal. Jan. 22, 1953. Decl. Mar. 9, 1957. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A small rotating plug was tested in a flowing Na system to evaluate the effect of Na_2O deposits on the rotation of the assembly. It was found that a noticeable torque was necessary to break the oxide deposit which formed. Once this break occurred the resistance to continued rotation was negligible. (auth)

12568 KAPL-M-S3G-RES-23
Knolls Atomic Power Lab., Schenectady, N. Y.
INTERCHANNEL MIXING. J. P. Fraser. Apr. 12, 1956. 11p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

A method is developed by which the temperature rise in a reactor may be corrected for interchannel mixing if the heat generation may be assumed to vary, in the transverse plane, in one direction only. This assumption is approximately satisfied in many regions of the rhombus matrix. The application of this method to reactor design will be written up after diffusion coefficients have been measured. (auth)

12569 KT-178
Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
CARRIER DESIGN OF IRRADIATED APPR FUEL ELEMENTS. F. D. Miraldi and A. D. Rossin. Nov. 17, 1954. Decl. Feb. 22, 1957. 34p. For Carbide and Carbon

Chemicals Co. K-25 Plant. Contract W-7405-Eng-26, Subcontract 70. $6.30(ph OTS); $3.00(mf OTS).

Irradiation tests are to be run on APPR fuel elements in the STR at Arco. Evaluation of the tests will be made at ORNL. The design of a carrier for shipping fuel element samples from Arco to ORNL is given. Both γ shielding and heat dissipation are considered. (D.E.B.)

12570 LA-1575

Los Alamos Scientific Lab., N. Mex.

DISASSEMBLY OF THE LOS ALAMOS FAST REACTOR. E. T. Jurney, G. P. Arnold, E. F. Corpieri, R. B. Leachman, E. H. Pierce, J. Montoya, W. D. Schafer, T. J. Thompson, M. Thorpe, and C. W. Zabel. July 1953. Decl. Apr. 1, 1957. 27p. Contract W-7405-eng-36. $0.30 (OTS).

The methods and procedures for disassembling the Los Alamos Fast Reactor are described. Some information on the radiation damage of the internal reactor materials is included. (K.S.)

12571 LA-1732

Los Alamos Scientific Lab., N. Mex.

CRITICAL MASSES OF GRAPHITE-TAMPED HETEROGENEOUS Oy–GRAPHITE SYSTEMS. J. C. Hoogterp. May 1954. Decl. Apr. 2, 1957. 34p. Contract W-7405-eng-36. $6.30(ph OTS); $3.00(mf OTS).

Critical mass measurements on graphite-tamped, heterogeneous oralloy (U^{235})–graphite systems have been made as a safety guide for certain oralloy casting procedures. Various concentrations were obtained by alternately stacking 10.5 in. diameter oralloy and graphite plates. In the relation Oralloy critical mass = constant × (fraction of oralloy/in the core volume)$^{-n}$ values for the exponent, n, in the neighborhood of 0.70 were obtained. (auth)

12572 MonP-386

Clinton Labs., Oak Ridge, Tenn.

A PROBLEM IN THE DESIGN OF AN OPTIMAL EXTERNAL BREEDING BLANKET. G. Goertzel. Sept. 16, 1947. Decl. Mar. 11, 1957. 18p. Contract W-35-038-eng-71. $0.25(OTS).

12573 MTR-L-218

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

ECONOMIC USE OF FUEL SHIMS IN TWO-WEEK CYCLES — 3 × 9 CONFIGURATION. H. L. McMurry. Oct. 15, 1953. Decl. Mar. 7, 1957. 15p. Contract AT(10-1)-205. $3.30(ph OTS); $2.40(mf OTS).

There is an optimum number of cycles for use of fuel shims which makes the cost of charging a two-week cycle in a 3 × 9 configuration a minimum. This is calculated to be seven cycles. The increase in cost by operating one or two cycles beyond seven is not large (~ $3,000. per year for 9 cycles). The cost increase is larger if two few cycles are used (~ $4,000. per year for five cycles and ~ $12,000. per year for four cycles). (auth)

12574 N-2281

Chicago. Univ. Metallurgical Lab.

THE CONTROL PROBLEM AND THE CRITICAL SIZE OF AN ENRICHED, BeO MODERATED PILE. A. V. Martin. May 15, 1946. Decl. Mar. 4, 1957. 8p. (MUC-RGS-AVM-5). $1.80(ph OTS); $1.80(mf OTS).

12575 NAA-SR-260

North American Aviation, Inc., Downey, Calif.

SODIUM GRAPHITE REACTOR QUARTERLY PROGRESS REPORT [FOR] DECEMBER 1952, JANUARY AND FEBRUARY 1953. G. M. Inman, ed. July 15, 1953. Decl. Mar. 5, 1957. 87p. Contract AT-11-1-GEN-8. $0.60 (OTS).

Work on the Sodium Graphite Reactor (SGR) was continued during the quarter. Emphasis was given to establishing the engineering requirements of some of the reactor and cooling system components. These included the fuel element, coolant tube, thermal and biological shields, fuel-handling coffin, and primary coolant piping and its compartments. The construction of components was completed for the fuel rod assembly apparatus and the tower experiment. Some analytical work associated with the neutron performance and safety characteristics of the reactor was completed. (auth)

12576 NAA-SR-895

North American Aviation, Inc., Downey, Calif.

A PEBBLE-BED REACTOR FOR STATIONARY POWER PLANTS. R. J. Beeley. May 15, 1954. Decl. Mar. 14, 1957. 22p. Contract AT-11-1-GEN-8. $0.25(OTS).

A preliminary study has been made of a solid homogeneous reactor for stationary power plant application. The core consists of graphite spheres impregnated with U and Th, and the coolant is Bi. This concept possibly offers advantages over other solid fuel reactor systems with respect to simplification of core structure, fuel fabrication and fuel handling, and reduction of fuel inventory external to the reactor. From the results of this preliminary study, it appears that the potential cost of electric power from this reactor is competitive with that from other reactor systems which have been proposed for the same application. The Po^{210} produced in the coolant presents a decontamination problem, but is also possibly a valuable by-product. (auth)

12577 NAA-SR-Memo-113

North American Aviation, Inc., [Downey, Calif.].

THE EFFECT OF DECAY TIME ON HEAT GENERATION IN AN URANIUM-IMPREGNATED GRAPHITE FUEL ELEMENT AFTER REMOVAL FROM A REACTOR. S. Nakazato. [195?]. Decl. Feb. 27, 1957. 11p. $3.30 (ph OTS); $2.40(mf OTS).

The equation which relates the excess temperature of a fuel rod with the radioactivity decay time has been derived. The approximation equation for the maximum excess temperature as a function of cooling time has been obtained. The heat liberation from decay of fission product has been estimated from the Borst-Wheeler curve. The results show that a high rate of removal from the rod should be maintained by a rapid circulation of fluid and by an increase of surface area. The results also show that the transfer period may be the factor which determines the cooling period. Radiation damage on the solvent may be the greatest determining factor in the selecting of the appropriate cooling interval. (auth)

12578 NAA-SR-Memo-174

North American Aviation, Inc., Downey, Calif.

PRELIMINARY CALCULATION OF FLUX DISTRIBUTION IN CONVERTER REACTOR CELLS. E. R. Cohen. Jan. 8, 1952. Decl. Mar. 27, 1957. 5p. Contract [AT-11-1-Gen-8]. $1.80(ph OTS); $1.80(mf OTS).

A calculation is presented for the flux distribution in converter reactor cells for the Uranium Production Reactor A cylindricalized cell model of the equivalent unit cell was considered which contained three U elements for each Th element. The calculation model was a quasi-iterative procedure starting with one neutron produced in fission and followed through a generation of slowing down in the reactor. An accounting of the neutron economy was made for each step, and the conversion ratio and multiplication constant determined after the cycle was completed. Four energy ranges for the neutrons are considered. Specifications are summarized for the U and Th elements. The calculations showed that this system did not have enough Th in it. (C.H.)

12579 NAA-SR-Memo-332
North American Aviation, Inc., Downey, Calif.
ADDITIONAL FLUX CALCULATIONS FOR CONVERTER REACTOR MOCK-UP. A[rnold] Benton. June 9, 1952. Decl. Mar. 28, 1957. 4p. Contract AT-11-1-GEN-8. $1.80(ph OTS); $1.80(mf OTS).

12580 NAA-SR-Memo-344
North American Aviation, Inc., [Downey, Calif.].
FABRICATION OF FUEL AND FOOD ELEMENTS FOR A CONVERTER REACTOR. W. L. Cockrell. May 28, 1952. Decl. Mar. 28, 1957. 5p. Contract [AT-11-1-GEN-8]. $1.80(ph OTS); $1.80(mf OTS).

The use of dovetail joint is proposed for the assembly of all Th elements for the Uranium Production Reactor. Problems associated with the fabrication of Al-clad Th plates, the fabrication of square flat plate fuel assemblies by use of rivets or bolts through spacer bars, and brazing methods for brazing the proposed assembly without the machining of side plates are discussed. (C.H.)

12581 NAA-SR-Memo-724 (Del.)
North American Aviation, Inc., Downey, Calif.
HEAT GENERATION IN THERMAL SHIELD AND CONCRETE OF THE URANIUM PRODUCTION REACTOR (UPR). H. L. Sletten. July 10, 1953. Decl. with deletions Feb. 28, 1957. 27p. $4.80(ph OTS); $2.70(mf OTS).

A study was made of the heat generation in the Fe thermal shield and the concrete earth-retaining wall of the reactor pit in order to specify the cooling requirements. The calculations were made for the plutonium production alternate of UPR since it places the highest heating load on the shield and they are based upon a total power of 500 Mw, a maximum thermal neutron flux in the core of 2×10^{13}, a graphite reflector thickness of 61 cm (2 feet), a thermal shield plus reactor tank thickness of 6 in., and concrete retaining wall of 2 ft. All calculations were made on a unit area basis at the midplane of the reactor core. The maximum temperature difference is 6°F in the thermal shield and 1°F in the reactor tank. The heat generation in the concrete for the as-shown design is about 466 Btu/hr-ft^2 of incident surface with 70% attributed to fast neutron capture gammas. It is suggested that 2 or 3 in. of water be added to the reactor radius between the graphite reflector and thermal shield in order to reduce the fast neutron leakages and consequently the total heat generation in the concrete to about 75 Btu/hr-ft^2. (auth)

12582 NAA-SR-Memo-818
North American Aviation, Inc., Downey, Calif.
NEUTRON FLUX MEASUREMENTS IN THE MOCK-UP OF THE URANIUM CONVERTER REACTOR. R. A. Laubenstein, W. J. Houghton, and D. H. Martin. Nov. 9, 1953. Decl Feb. 28, 1957. 13p. Contract [AT-11-1-gen-8]. $3.30 (ph OTS); $2.40(mf OTS).

A brief description is presented of the converter reactor mock-up experiment. Some preliminary results obtained on the first two mock-up assemblies are discussed. Data are included on thermal flux distributions in the vicinity of each of five different shim or safety rods inserted into the center of the mock-up core, thermal and resonance flux distributions in a checkerboard assembly consisting of alternate fuel assemblies and Th assemblies, and neutron age for two different mixtures of Th and light water. (C.H.)

12583 NPG-111
Nuclear Power Group, Chicago.
BOILING AND FLASHING REACTOR CENTRAL STATION POWER PLANT DESIGN STUDY. W. N. McLean and M. N. Chiarottino, eds. Feb. 1, 1955. Decl. Feb. 28, 1957. 220p. $1.10(OTS).

The design and operating details of a heterogeneous boiling reactor for a 180 Mw (net electrical) nuclear power plant are presented. The principal features of a boiling type reactor and a flashing type reactor have been combined in the reactor design. Cost estimates are given. (C.W.H.)

12584 ORNL-1221
Oak Ridge National Lab., Tenn.
HOMOGENEOUS REACTOR PROJECT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING NOVEMBER 15, 1951. W. E. Thompson, comp. Apr. 1, 1952. Decl. Mar. 22, 1957. 171p. Contract W-7405-eng-26. $25.80(ph OTS); $7.80(mf OTS).

Buildings and facilities of the HRE are reported to be nearly completed. Data are given from studies of the corrosive effects of uranyl sulfate on stainless steel and titanium. Data from preliminary studies of the fuel system, fuel circulating system, and operating control of the HRE are given in detail. Data from a study of homogeneous reactor fuel solution processing is included. Criticality studies on the Los Alamos water boiler are reported. (C.H.)

12585 ORNL-1318
Oak Ridge National Lab., Tenn.
HOMOGENEOUS REACTOR PROJECT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING JULY 1, 1952. W. E. Thompson, comp. Sept. 19, 1952. Decl. Mar. 2, 1957. 174p. Contract W-7405-eng-26. $27.30(ph OTS); $8.10(mf OTS).

The Homogeneous Reactor Experiment reached criticality during this period. Shim-rod and reflector-level calibration curves, temperature and pressure coefficients of reactivity, and inhour curves are plotted. Pulsafeeder pump development and design of a fuel-solution sampling apparatus are discussed. Extensive corrosion studies on stainless steels, Stellite, Ti, Ta, Ni, and Ni alloys in UO_2SO_4 solutions, H_2SO_4, HNO_3, H_2CrO_4, and UO_2F_2 solutions are reported. Effects of O_2 pressure, corrosion inhibitors, and radiation are discussed. Data on radiation stability of aqueous UO_2SO_4, decomposition of H_2O_2 in UO_2SO_4 solutions, and solubility of UO_4 are tabulated. Reactivity calculations are presented for the Teapot and other proposed boiling reactors. Slurry fuel studies reported include preparation, stability, viscosity, and radiation chemistry of $UO_3 \cdot H_2O$ and erosion of pump bearings and impellers. A slurry boiler is sketched. Flow-sheets, component design, and criticality and core-circulation calculations for the Intermediate Scale Homogeneous Reactor are presented. Data are given on gas production from pile-irradiated $UO_2(NO_3)_2$, UO_2SO_4, $U(SO_4)_2$, and UO_2F_2, catalytic recombination of H_2 and O_2, Pu solubility in UO_3–H_3PO_4–H_2O solutions, Pu valence changes in γ-irradiated solutions, vapor pressure and conductivity of aqueous UO_2SO_4, solubilities of Ag_2SO_4, $BaSO_4$, and UO_3 in aqueous UO_2SO_4, two-liquid phase temperatures in UO_3–UO_2SO_4–H_2O systems, high-temperature reference electrodes, adsorption of Pu on stainless steel, and chemistry of Pu in UO_2SO_4 solutions. Fabrication of Ti pump impellers is discussed. Studies of solvent extraction of Np under Purex Process conditions are reported, and costs of UF_6 distillation and TBP extraction for processing UO_2SO_4 fuel solutions are compared. (G.Y.)

12586 ORNL-1810
Oak Ridge National Lab., Tenn.
SOME ECONOMIC ASPECTS OF THORIUM BREEDER REACTORS. H. C. Claiborne and M. Tobias. Oct. 27, 1955. Decl. Feb. 23, 1957. 60p. Contract W-7405-eng-26. $0.50(OTS).

A study of the effects of geometrical and some operational variables on the economics and characteristics of thorium power-breeder reactors has been made as an aid in the

selection of design criteria for the TBR program. The effect on power cost of core radius, blanket thickness, blanket U and Th concentrations, chemical processing cycle times, poisons, and external power density have been investigated. All results are for a 3-reactor power station delivering 375 Mw of electricity to a power grid. The results, based on operating and maintenance costs for conventional power and chemical plants, indicate that a 2-region reactor station could produce power for 6.2 mills/kwh with a fuel cost of 1.8 mills/kwh. The cost of power from a 1-region reactor station would be about 0.9 mills/kwh higher if plant investment and other fixed charges are considered equal for the 2 types. (M.P.G.)

12587 ORNL-2036
Oak Ridge National Lab., Tenn.
A BIBLIOGRAPHY OF ORNL-BSF REPORTS PERTINENT TO SWIMMING POOL TYPE REACTOR DESIGN (REVISED). F. C. Maienschein and E. B. Johnson. Apr. 13, 1956. Decl. Mar. 2, 1957. 13p. Contract W-7405-eng-26. $0.25(OTS).

12588 ORNL-2089
Oak Ridge National Lab., Tenn.
HRT REACTOR HAZARDS. E. C. Miller. Aug. 3, 1956. Decl. Mar. 2, 1957. 14p. Contract W-7405-eng-26. $0.30(OTS).

Several potential hazards that have been recognized and anticipated in the design and fabrication of the pressure vessel for the HRT are discussed. These hazards result from the high operating pressure and temperature of the reactor, the exposure of the reactor vessel material to potential embrittlement and other effects of fast-neutron irradiation, and the need for containment of corrosive flowing liquids. The steps taken in recognition of these hazards are also discussed. The applicability of present codes to the reactor vessel fabrication is considered. Additional fields are suggested where recommended practices developed by code-writing bodies could assist in development-type reactor design and fabrication. (auth)

12589 SEP-49
Sylvania Electric Products, Inc., Bayside, N. Y.
PROGRESS REPORT ON THE FABRICATION OF WIRE FUEL ELEMENTS. J. L. Zambrow. Mar. 26, 1951. Decl. Mar. 5, 1957. 33p. Contract AT-30-1-gen-366. $4.80(ph OTS); $2.70(mf OTS).

Procedures are described for the fabrication of composite wires of two types; wire composed of a Zr sheath and a Zr–U alloy core, and wire composed of a stainless steel sheath and a Ag–Cd alloy core. A method of testing the core-to-sheath bond of composite wires is also described. Data on the corrosion resistance of the wires are included. (auth)

12590 TID-5202
North American Aviation, Inc., Downey, Calif.
ATOMIC ENERGY COMMISSION SYMPOSIUM ON REACTOR HAZARDS. Minutes of Meeting [Held] at New York Operations Office, New York City, April 15, 1950. M. M. Mills. Decl. Mar. 28, 1957. 19p. $3.30(ph OTS); $2.40(mf OTS).

The possibilities and nature of reactor supercriticality are reviewed. The consequences of supercritical excursions range from fuel element damage to explosive reactor destruction. Further investigation of supercriticality in specific reactor types is recommended. (D.E.B.)

12591 TID-5352
Argonne National Lab., Lemont, Ill.
EBR-I OSCILLATIONS: INFINITIES IN THE TRANSFER FUNCTION WITH POSITIVE AND NEGATIVE THERMAL FEED-BACK FOR SINUSOIDAL POWER VARIATION. A. J. Ulrich. May 18, 1956. Decl. Jan. 17, 1957. 4p. Contract [W-31-109-eng-38]. $1.80(ph OTS); $1.80(mf OTS).

12592 TID-5367
Du Pont de Nemours (E. I.) & Co. Savannah River [Lab.], Augusta, Ga.
BUILDING 305-M TEST PILE STARTUP. L. W. Fox, L. C. Heck, K. E. Plumlee, and R. A. Webb, Jr. May 19, 1954. Decl. Mar. 6, 1957. 24p. Contract [AT(07-2)-1]. (DPSP-53-167). $4.80(ph OTS); $2.70(mf OTS).

12593 TID-5397
Du Pont de Nemours (E. I.) & Co. Atomic Energy Div., Wilmington, Del.
CLEANING OF NYX REACTOR. NYX Test Number 1.4.2. A. A. Johnson and F. J. Poss. Feb. 1953. Decl. Mar. 20, 1957. 21p. Contract AT(07-2)-I. (DPXN-213). $3.30(ph OTS); $2.40(mf OTS).

12594 TID-10004
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
DIFFUSION LENGTHS IN HETEROGENEOUS CYLINDRICAL ASSEMBLIES. H. Neumann. Sept. 25, 1953. Decl. Mar. 16, 1957. 10p. Contract W-31-109-Eng-52. $0.15 (OTS).

Small-source theory is used to determine the asymptotic thermal neutron diffusion lengths in a medium consisting of cylindrical absorbing rods imbedded in a moderator. Formulas are presented for the diffusion lengths perpendicular to and parallel to these columns, and it is shown how these diffusion lengths may be combined to give an average diffusion length for the medium. Numerical application of these formulas is presented. Diffusion lengths parallel to absorbing columns are found to be characteristically longer than perpendicular to columns, by a small amount. (auth)

12595 TID-10014
Atomic Electric Project, St. Louis.
SODIUM GRAPHITE REACTOR — UPFLOW DESIGN. Sept. 30, 1953. Decl. Mar. 20, 1957. 122p. $0.60(OTS).

Mechanical design and operation, reactor characteristics, preliminary safety characteristics, and economic considerations of the upflow reactor are reported. (L.T.W.)

12596 TID-10031
Pacific Gas and Electric Co., San Francisco and Bechtel Corp., San Francisco.
REPORT OF INDUSTRIAL REACTOR STUDY. May 14, 1952. Decl Mar. 18, 1957. 96p. $0.50(OTS).

Several power breeder reactor proposals are presented. Among the proposals are a pressurized water reactor, a liquid metal cooled fast reactor, a liquid metal cooled graphite moderated reactor, a liquid metal fuel reactor, and a aqueous homogeneous reactor. Economic evaluations were made of each design. (D.E.B.)

12597 TID-10037
North American Aviation, Inc., Downey, Calif.
ELEMENTARY STUDY OF THE NEUTRON CYCLE IN HOMOGENEOUS EPITHERMAL REACTORS. R. Balent and C. Roderick. Nov. 12, 1951. Decl. Apr. 2, 1957. 21p. Contract AT(11-1)-GEN-8. $0.25(OTS).

Results of criticality by both Fermi-age theory and epithermal calculations are given for high temperature homogeneous, U^{235} -graphite, bare reactors. Comparisons are made of critical size and mass for different fuel concentrations ranging from a thermal reactor to a fast reactor. Also, results of neutron life cycles for three different fuel concentrations (thermal, epithermal, and fast) are depicted graphically. The life cycles indicate the amount of leakage, non-productive absorption, and produc-

tive (fission) absorption in each of 19 equal log bands from fission to thermal energy. As can be expected, Fermi-age theory gives more conservative (i.e., larger) estimates of critical size and mass than does an epithermal calculation. The results of this study indicate that if the ratio of moderator to fuel is greater than 30,000 to 1, the difference in critical size is less than 1%, and in critical mass is less than 2%. For an atomic ratio of 3000 to 1, the difference in critical size is 4% and in critical mass is 15%, for an atomic ratio of 300 to 1 the difference in critical size is 15%, and in critical mass is 50%, and for an atomic ratio of 30 to 1 the difference in critical size is 55% and in critical mass is 300%. (auth)

12598 TID-10048
Los Alamos Scientific Lab., N. Mex.
THE LOS ALAMOS FAST PLUTONIUM REACTOR. E. T. Jurney, Jane H. Hall, David B. Hall, Avery M. Gage, Nat H. Godbold, Arthur R. Sayer, and Earl O. Swickard. May 1954. Decl. Mar. 13, 1957. 144p. Contract W-7405-eng-36. $0.65(OTS).

The Los Alamos Fast Plutonium Reactor is a low-power reactor built primarily to demonstrate the feasibility of a reactor operating on fast neutrons and to serve as an experimental facility. The operating power level of 25 kw produces a fast flux of approximately 4×10^{12} nvt. The reactive region consists of a lattice arrangement of metallic Pu fuel rods surrounded by normal U reflector material and cooled by flowing Hg. Experimental facilities consist of numerous fast neutron ports and a graphite thermal column. (auth)

12599 TID-10058
Kidde (Walter) Nuclear Labs., Inc., Garden City, N. Y.
A 37,500 KW POWER REACTOR WITH COMPETITIVE POSSIBILITIES. W. I. Thompson and Karl Cohen. Feb. 26, 1954. Decl. Mar. 13, 1957. 112p. Contract AT(30-1)-1374. $0.55(OTS).

The design, economics, and nuclear characteristics of a 37.5 Mw light water moderated, slightly enriched uranium reactor are reported. (L.T.W.)

12600 TID-10075
Knolls Atomic Power Lab., Schenectady, N. Y.
FEASIBILITY REPORT FOR THE KAPL THERMAL TEST REACTOR. H. B. Stewart, F. G. LaViolette, G. L. McClelland, G. B. Gavin, and T. M. Snyder. Nov. 9, 1950. Decl. Mar. 22, 1957. 31p. Contract W-31-109-Eng-52. $0.30(OTS).

The KAPL Thermal Test Reactor can be used either for the measurement of danger coefficients and activation in very small samples or in samples of low nuclear cross sections. The installation is simple and inexpensive. It will use about 3 kg of the PPA fuel (Al–U alloy). The purpose, description, operation, and safety analysis of the TTR are outlined. (L.T.W.)

12601 TID-10085
[Chicago. Univ.] Metallurgical Lab.
DESIGN OF FAST NEUTRON BREEDER TEST PILE. W. H. Zinn. Jan. 25, 1946. Decl. Mar. 5, 1957. 32p. $0.30(OTS).

12602 TID-10086
North American Aviation Inc., Downey, Calif.
FUEL ROD COOLING IN NATURAL URANIUM REACTORS. C. A. Trilling. Jan. 28, 1952. Decl. Mar. 15, 1957. 62p. Contract AT-11-1-GEN-8. $0.40(OTS).

An analysis is reported of the transfer of heat from a cylindrical fuel rod surrounded by a fast flowing coolant in an annular duct, with maximum power output limited by fuel rod temperatures, coolant pressure drop, and pumping power requirements. A method is presented for comparing and evaluating various liquid and gaseous coolants within these limitations. Some calculated results are discussed for the production of Pu and useful power from natural uranium reactors. (auth)

12603 WAPD-117
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
REACTOR PROPERTIES OF WATER MODERATED SLIGHTLY ENRICHED URANIUM LATTICES. J. R. Brown, B. H. Noordhoff, A. E. Profio, and W. O. Bateson. Nov. 1954. Decl. Mar. 22, 1957. 54p. Contract AT-11-1-Gen-14. $9.30(ph OTS); $3.60(mf OTS).

Experiments involving clean critical assemblies of slightly enriched fuel rods in a water-moderated lattice, operated at low power, have been performed in the TRX Reactor for several water-to-U ratios. The reactor properties measured as a function of water-to-U ratio include the number of fuel rods required for criticality and from this the geometrical buckling; measurement of the migration area (M^2) from a differential water worth vs. water height experiment; and the temperature coefficient of reactivity as a function of temperature. The TRX Reactor is described. (auth)

12604 WAPD-ADC-61
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
RADIOCHEMICAL ANALYSES OF THE S1W PLANT PARTICULATE CORROSION PRODUCTS FOR THE PERIOD OF THE EXTENDED HIGH POWER RUN—JUNE 3, 1956 TO AUGUST 8, 1956. Richard S. Gilbert, Robert N. Osborne, George L. Grandy, and Edgar R. Howard. Dec. 3, 1956. 18p. $3.30(ph OTS); $2.40(mf OTS).

12605 WAPD-CTA(MP)-39(Rev. 3)
[Westinghouse Electric Corp. Bettis Plant, Pittsburgh.]
SUPPLEMENTAL REQUIREMENTS APPLICABLE TO THE MATERIALS, FABRICATION AND TESTING OF CARBON AND LOW ALLOY STEEL PRESSURE VESSELS. Jan. 29, 1957. 10p. With this is bound WAPD-CTA(MPS)-267: ADDENDA TO FEDERAL SPECIFICATION, QQ-S-691a, "STEEL; PLATE, CARBON, MARINE BOILER" DATED 4 AUGUST 1955 FOR NUCLEAR PLANT APPLICATIONS. Sept. 28, 1956. 1st Rev. Jan. 25, 1957. 4p. $3.30(ph OTS); $2.40(mf OTS).

12606 WAPD-LSR(IM)-2
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
IN-PILE HEAT TRANSFER BURNOUT TESTS AT THE MTR. H. F. Dobel, S. J. Green, and J. E. Zerbe. [1955]. Decl. Mar. 5, 1957. 61p. Contract AT-11-1-GEN-14. $0.50(OTS).

In-pile heat transfer burnout tests conducted in a horizontal channel in the MTR are described. The results indicate no difference between electrical and in-pile burnouts. However, the continuance of in-pile testing is recommended for the study of prototype fuel elements. (D.E.B.)

12607 WAPD-MDM-28
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
PRELIMINARY EVALUATION OF PWR FUEL ROD ASSEMBLY METHODS. W. L. Frankhouser and A. H. Kasberg. Mar. 10, 1955. Decl. Feb. 23, 1957. 80p. Contract AT-11-1-GEN-14. $0.55(OTS).

A preliminary evaluation of all Pressurized Water Reactor fuel rod assembly designs proposed to date is presented. Reasons are given for elimination from consideration of the majority of the designs. Five types are proposed for further evaluation. One fusion welded type

(Tube Sheet–Regular Rod End) and one mechanical type (Egg Crate) are believed to justify consideration as reference designs for development work in the design and construction of assemblies. (auth)

12608 WAPD-MRP-63
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
PRESSURIZED WATER REACTOR PROGRAM TECHNICAL PROGRESS REPORT FOR THE PERIOD JUNE 23, 1956 TO AUGUST 23, 1956. Decl. Mar. 20, 1957. 93p. Contract AT-11-1-GEN-14. $0.60(OTS).

12609 WAPD-NCE-3509
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
SPECIFICATION FOR HELIUM LEAK TESTING OF PWR CORE I BLANKET COMPONENTS–PROCESS SPECIFICATION AP-292542 (Rev. 3). [Feb. 4, 1957]. 5p. $1.80(ph OTS); $1.80(mf OTS).

Specifications are given that covers the leak testing of PWR fuel rods and fuel rod bundles. (W.L.H.)

12610 WAPD-PWR-CP-2664
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
TRITIUM HAZARD RESULTING FROM THE USE OF LiOH IN PWR. A. S. Kesten. Jan. 4, 1957. 8p. $1.80(ph OTS); $1.80(mf OTS).

Lithium hydroxide has been suggested as a means for giving a high pH to the coolant water in PWR. Natural Li has a high cross-section for the reaction $Li^6(n,\alpha)H^3$, and the resultant tritium decays with a 12.4 year half-life by the emission of a 0.019 mev beta particle. Although this low level of beta activity presents no direct radiation problem, there exists the possibility that leakage from the primary system or evaporation from the fuel storage canal may create an ingestion hazard, particularly since the tritium is expected to be almost completely in the chemical form of tritiated water. The purpose of this report is to evaluate the tritium hazard which would exist were LiOH to be used in PWR. (auth)

12611 WAPD-PWR-PS-2672
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
GAMMA RADIATION LEVELS FROM DEPOSITED FISSION PRODUCTS IN THE PRIMARY SYSTEM. R. F. Devine. Jan. 23, 1957. 5p. Contract AT-11-1-GEN-14. $1.80(ph OTS); $1.80(mf OTS).

Estimates are given of the level of fission product activity deposited on the inside walls of the PWR vessel and on other piping and vessels with no decomposition. (W.L.H.)

12612 WAPD-PWR-RDA-281
[Westinghouse Electric Corp. Bettis Plant, Pittsburgh.]
CORE I FLOW DISTRIBUTION IN A QUARTER-SCALE MODEL OF THE PWR REACTOR. Evaluation of Studies [presented in] BMI-1141. F. A. Grochowski. [Jan. 2, 1957]. 3p. $1.80(ph OTS); $1.80(mf OTS)

12613 WAPD-S5W-TH(S)-352
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
RESULT OF INVESTIGATION ON RECOMMENDATIONS CONCERNING THE SSN 585 COOLANT PRESSURIZING SYSTEM CONTAINED IN THE REPORT OF THE S5W FLUID SYSTEMS REVIEW COMMITTEE. John A. Logan. Jan. 7, 1957. 4p. Contract AT-11-1-GEN-14. $1.80 (ph OTS); $1.80(mf OTS).

12614 WAPD-T-340
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THE EFFECT ON REACTOR KINETICS OF DELAYED NEUTRONS FROM URANIUM-238 FISSIONS AND OVERALL DELAYED NEUTRON LEAKAGE. P. H. Jarvis. [June 1956]. 14p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

12615 Y-533
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
AN EMPIRICAL STUDY OF SOME CRITICAL MASS DATA. C. L. Schuske and J. W. Morfitt. Dec. 6, 1949. Decl. Mar. 7, 1957. 23p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

A simple empirical equation has been found which relates the critical height of a water-enclosed stainless steel reactor at a given moderation to its diameter. Certain empirical constants appearing in the relation have a simple physical interpretation which succeeds to a limited extent in bridging the gap between the experimental results with finite cylindrical reactors and Grueling's ("Theory of Water-Boiler," LA-399, September 27, 1945), theoretical treatment which is limited to infinite cylinders or slabs. The report also discusses certain comparisons between theoretical and experimental results. (auth)

PARTICLE ACCELERATORS

12616 LRL-81
California Research and Development Co., Livermore Research Lab., Livermore, Calif.
MARK I MTA LINEAR ACCELERATOR RUN NO. 5. P. V. Livdahl and R. J. Vetterlein. Jan. 1954. Decl. Mar. 29, 1957. 14p. Contract AT(11-1)-74. $3.30(ph OTS); $2.40 (mf OTS).

Mark I MTA Linear Accelerator Run No. 5 covers a period of operation from Nov. 13 through Nov. 17, 1952. Run No. 5 was characterized by the removal from the cavity of the No. 1 drift tube and drift tube stem. This configuration eliminated the two shortest drift tube gaps. Damaging sparks in these short gaps had limited voltage-holding ability in previous runs. The purpose of Run No. 5 was to test the voltage-holding ability without this limitation. An end-to-end voltage of 27.8 Mv was achieved, and 25 Mv could be held steadily. No damaging sparks had occurred, and voltage was still being increased at the end of the run. This run was discontinued in order to install the new Inconel drift tubes (No. 0 and 1) for Run No. 6. (For preceding report in series see LRL-77.) (auth)

12617 LRL-90
California Research and Development Co. Livermore Research Lab., Livermore, Calif.
MARK I MTA LINEAR ACCELERATOR RUN NO. 7. S. P. Stone and R. J. Vetterlein. Mar. 1954. Decl. Mar. 29, 1957. 17p. Contract AT(11-1)-74. $3.30(ph OTS); $2.40 (mf OTS).

Run 7 covers the experimental operation of Mark I from March 25 to April 21, 1953. It followed an eleven-day shutdown to remove the Inconel drift tube number one which was damaged by sparking, causing termination of Run No. 6. Shutdown also permitted installing an OFHC copper drift tube number zero. This run was intentionally performed without a number one drift tube. A peak end-to-end voltage of 33.5 Mv with a 30 per cent duty cycle and 23 Mv with CW operation were attained which exceeded all past performance. No spark damage to the drift tubes resulted which added to the evidence that there is a definite minimum gap length that can be tolerated, shorter than which spark damage will occur. The shortest gap present in this run was 17 inches. Other factors influencing sparking tendencies, such as the presence of stray proton beam and the effects of the focusing magnets, were also investigated. Run No. 7 was concluded to permit installation of the new OFHC copper

drift tube number one. (For preceding report in series see LRL-89.) (auth)

12618 LRL-93

California Research and Development Co. Livermore Research Lab., Livermore, Calif.

MARK 1 MTA LINEAR ACCELERATOR RUN NO. 10. D. H. Birdsall. Feb. 1954. Decl. Mar. 4, 1957. 51p. Contract AT(11-1)-74. $7.80(ph OTS); $3.30(mf OTS).

Results of the final experimental run on the Mark I linear accelerator are described. New grid-driven power amplifiers for exciting the cavity reduced by a large factor the time required to reach proton-accelerating voltage. Optimum injection voltage of 60 to 70 kv was reaffirmed under conditions of careful injector alignment with cavity. Better operating factors at higher average beam currents were attained. All accelerator components were in good operating condition when the run was terminated. (auth)

12619 LRL-96

California Research and Development Co., Livermore, Calif.

MTA PROJECT ACCELERATOR. QUARTERLY PROGRESS REPORT [FOR] APRIL THROUGH JUNE 1953. May 1954. Decl. Mar. 4, 1957. 49p. Contract AT(11-1)-74. $7.80(ph OTS); $3.30(mf OTS).

Improved operation of the MTA Mark I accelerator is reported. A Cu electrode grid was installed in the injector, strong-focusing was incorporated in the magnet system, and bunching of the ion source beam was tested. The influence of drift-tube configuration, beam acceptance, and injection voltage factors was studied by tests with scale models. The design of an r-f toroid transformer is described for measuring the beam current of the accelerator without disturbing the beam. Cost estimates for 50- and 100-Mc accelerators are presented. (K.S.)

12620 LRL-102(Del.)

California Research and Development Co. Livermore Research Lab., Livermore, Calif.

STATUS OF THE MTA PROCESS. Feb. 1954. Decl. with deletions Feb. 27, 1957. 115p. Contract AT(11-1)-74. $18.30(ph OTS); $6.00(mf OTS).

The results of the MTA research and development program since presentation of the A-12 MTA plant concept are summarized. A new MTA Pu production plant concept, C-50, is presented and compared to the previous A-12 concept. The numerous process improvements incorporated in the C-50 concept combine to increase the operability of an MTA plant as well as lower the estimated product cost. (auth)

12621 LRL-123

California Research and Development Co. Livermore Research Lab., Livermore, Calif.

THE MTA MARK I ACCELERATOR RF SYSTEM. S. P. Stone. May 1954. Decl. Mar. 25, 1957. 36p. Contract AT(11-1)-74. $6.30(ph OTS); $3.00(mf OTS).

The radiofrequency power system for exciting the Mark I linear accelerator is described. Time average power requirements of 4 to 5 megawatts to excite the cavity and accelerate the beam at a frequency of about 12 mc made this system quite unusual. The problems encountered and their solutions are presented for the developmental operation of the pre-exciters, the main oscillators, and the control circuits. (auth)

RADIATION EFFECTS

12622 BMI-986

Battelle Memorial Inst., Columbus, Ohio.

EFFECT OF RADIATION ON THE THERMAL CONDUCTIVITY OF URANIUM – 1.6 w/o ZIRCONIUM. H. W. Deem, M. Pobereskin, E. C. Lusk, C. F. Lucks, and G. D. Calkins. Mar. 16, 1955. Decl. Feb. 28, 1957. 20p. Supported by Atomic Power Development Associates through Contract W-7405-eng-92. $0.30(OTS).

Thermal-conductivity measurements were made with the heatwave method on the uranium-1.6 w/o zirconium alloy at a burnup of 0.21 and 0.75 a/o. On the basis of an interpolated thermal-conductivity value of 0.063 cal/(sec)(cm)(C) for the unirradiated alloy, the reduction in thermal conductivity for 0.21 and 0.75 a/o burnup was 8 and 9.5%, respectively. (auth)

12623 CF-56-6-127

Oak Ridge National Lab., Tenn.

FUEL MELTING EXPERIMENT — IRRADIATION REQUEST ORNL-MTR-28, PHASE A. F. H. Neill. June 20, 1956. Decl. Feb. 22, 1957. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The irradiation program to obtain information about gaseous fission product release from the melting of an APPR fuel element is presented. (T.R.H.)

12624 KAPL-954(Del.)

Knolls Atomic Power Lab., Schenectady, N. Y.

THE EFFECT OF IRRADIATION ON THE MECHANICAL PROPERTIES OF METALS: THE PRESENT STATUS OF THE PROGRAM. J. R. Low, Jr., and C. A. Bruch. July 1, 1953. Decl. with deletions Feb. 25, 1957. 19p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

A program for investigating the effect of neutron bombardment on the mechanical properties of metals on a pre-irradiation-postirradiation basis is well under way. The irradiation variables to be studied include nv, nvt, and temperature. The group of metals to be studied includes high-purity Ni, Cu, Fe, Mo, Zr, and commercial purity Ti and Type 347 stainless steel. Specimens are already in the process of being irradiated and tested. Most of the remotely operable testing equipment has been built and is in operating condition. Some of the first test results obtained are included. (auth)

12625 MTRL-119

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

IRRADIATION OF THORIUM "W" SLUGS IN A-40 AT 30 MEGAWATTS. G. H. Hanson. May 22, 1953. Decl. Mar. 29, 1957. 5p. Contract AT(10-1)-205. $1.80(ph OTS); $1.80(mf OTS).

12626 NAA-SR-836(Del.)

North American Aviation, Inc., Downey, Calif.

EFFECT OF REACTOR IRRADIATION ON THE THERMAL CONDUCTIVITY OF URANIUM IMPREGNATED GRAPHITE AT ELEVATED TEMPERATURES. Richard E. Durand, David J. Klein, and Florian R. Nykiel. Apr 29, 1954. Decl. with deletions Mar. 4, 1957. 44p. Contract AT-11-1-Gen-8. $7.80(ph OTS); $3.30(mf OTS).

An experiment to determine the effect of reactor irradiation on the thermal conductivity of uranium-impregnated graphite at elevated temperatures is described. The results show a decrease in the thermal conductivity saturating at ~60% at a temperature of 700°C; at ~50% at a temperature of 1000°C; and at ~25% at a temperature of 1300°C. It was found that after irradiation at a given temperature, exposure at a higher temperature resulted in an increase in the thermal conductivity. The converse was also observed. Within the precision of measurement there was no difference in effect between temperature changes produced by varying the fission rate in the samples and changes produced by varying the power in an external heater. (auth)

12627 WAPD-STR(Ph)-83
[Westinghouse Electric Corp. Bettis Plant, Pittsburgh.]
NEUTRON BOMBARDMENT EFFECTS IN SEMICONDUCTORS. William Russ. Sept. 1955. 23p. $4.80(ph OTS); $2.70(mf OTS).

Radiation effects on solids in general are discussed and extended to the special case of semiconductors. Some experimental work on neutron bombardment of n-type Ge and p-type Ge semiconductors is described. (T.R.H.)

SHIELDING

12628 CF-48-9-183
Oak Ridge National Lab., Tenn.
THE ABSORPTION AND SCATTERING OF RADIATION BY RANDOM AGGREGATES OF PEBBLES. Nicholas M. Smith, Jr. Sept. 23, 1948. Decl. Apr. 8, 1957. 27p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

It has been suggested that a porous shield composed of a random stack of appropriately shaped pebbles would allow the reactor coolant to pass through the shield and would at the same time preserve the shielding and keep the total weight to a minimum. Consideration is given to the characteristics of such a shield and particularly to the geometrical effect of the voided volumes on the radiation attenuation and scattering of a random stack of pebbles. The theory and calculations of this absorption are outlined. (B.J.H.)

12629 LWS-24734
California Research and Development Co., Livermore, Calif.
RADIOACTIVITY OF RECYCLED LIQUID METAL COOLANTS. W. E. Drummond. Jan. 30, 1953. Decl. Mar. 29, 1957. 3p. (CRD-R-23). $1.80(ph OTS); $1.80(mf OTS).

In order to determine which liquid metal coolant is the most desirable from the shielding standpoint, sample calculations were made to determine the thickness of concrete needed to shield a semi-infinite pool of the material. These calculations were made for Na, K, Pb, Bi, Sn, and Hg. (B.J.H.)

URANIUM AND URANIUM COMPOUNDS

12630 BMI-834
Battelle Memorial Inst., Columbus, Ohio.
CREEP STRENGTH OF URANIUM ALLOYS AT 1500 AND 1800 F. H. A. Saller, J. T. Stacy, N. S. Eddy, and H. L. Klebanow. May 28, 1953. Decl. Feb. 14, 1957. 36p. Contract W-7405-eng-92. $4.80(ph OTS); $2.70(mf OTS).

The creep resistance of various U binary alloys was investigated at 1500 and 1800°F in vacuum. Tests were made on alloys of U with Be, Nb, Mo, Ta, Ti, and Zr and on Mo–UO_2 composites. Of the alloys examined, those of the U–Mo system exhibited the best creep resistance. At 1500°F, creep rates of about 0.005%/hr were produced in U-Mo alloys by a stress of 2500 psi and, at 1800°F, similar creep rates were obtained in composites of 90 wt.% Mo–10 wt.% UO_2 by a stress of 12,000 psi. (auth)

12631 CF-50-9-117
[Oak Ridge National Lab., Tenn.]
TEMPERATURE DISTRIBUTION IN A METAL CYLINDER. David W. Whitcombe. Sept. 20, 1950. Decl. Feb. 13, 1957. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80 (mf OTS).

Calculations were made of the steady state radial temperature distribution in a solid U bar when a current of the order of 15,000 amps/in.^{2} was run through it, and resulting equations are given. (B.J.H.)

12632 CF-54-8-221
Oak Ridge National Lab., Tenn.
A REPORT ON CRITICAL DIMENSIONS OF CYLINDERS. Richard C. Keen. Aug. 31, 1954. Decl. Apr. 1, 1957. 18p. Contract [W-7405-eng-26]. $0.30(OTS).

Curves showing the relationship between the critical heights and critical diameters of stainless steel cylinders having wall thicknesses of $\frac{1}{16}$ in. and containing aqueous solutions of UO_2F_2 and enriched U have been plotted for several values of H to U^{235} atomic ratios. A critical size nomograph is presented for simple geometries. If the dimensions of one critical shape are known, then the dimensions for a series of similar shapes using the same assay material may be determined from the nomograph. Criticality relationships are also considered for cylindrical annuli and cylinders with small axial poison rods. (M.P.G.)

12633 KS-317(Del.)
Carbide and Carbon Chemicals Co. [K-25 Plant], Oak Ridge, Tenn.
THE INTERACTION OF BARE SYSTEMS OF CONTAINERS. PART I. L. Geller. Sept. 26, 1952. Decl. with deletions Feb. 28, 1957. 32p. Contract [W-7405-eng-26]. $6.30 (ph OTS); $3.00(mf OTS).

A theoretical solution of the problem of interaction between containers filled with fissile materials in the ORGDP is given, based on a macroscopic, multigroup diffusion model in which a dual coupling matrix is the fundamental interaction parameter, and which is essentially a modified first order perturbation. (M.H.R.)